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BEE-KEEPING IN VICTORIA.

(Continued from page 548.)

By F. R. Beuhne, Bee Expert.

XVI.—TRANSFERRING BEES.

Owners of bees in box hives who wish to adopt the more profitable frame hive, or upon whom it has become obligatory to do so, can transfer their bees to frames by whichever one of the three methods described below best suits their circumstances. It may here be pointed out that the adoption of frame hives does not necessarily involve the purchase of expensive hives, honey extractor, and other appliances. Bees may be kept in home-made frame hives, and the honey taken by cutting out of the frames those combs which contain no brood and returning the frames to the hives to be refilled with comb by the bees. A strip of comb 1 inch wide should be left along the top bar of the frame; if this is cut to a V edge, very little honey will be left in the frame, and the necessity for putting a fresh strip of comb foundation into the frame is avoided, while yet straight comb building is insured.

Under the *Bees Act* 1910, the Governor in Council may proclaim districts in which bees may not be kept in other than prescribed hives. By a regulation under the Act (*vide Victorian Government Gazette* of 7th May, 1913), "Prescribed hive" shall mean any hive, the combs of which are in frames and capable of easy removal for the purpose of inspection. In a proclamation of the same date certain districts are enumerated in which the transferring of all box hive bees to prescribed hives becomes obligatory.*

* The districts mentioned in the Proclamation are the Boroughs of Ararat, Clunes, Hamilton, Horsham, Port Fairy, Portland, Sale, Maryborough, Stawell, Talbot and the Shires of Arapiles, Ararat, Avoca, Avon, Bairnsdale, Belfast, Dundas, McIvor, Maffra, Minhamite, Mount Rouse, Portland, Stawell, Strathfieldsaye, Talbot, Wannon, and Wimmera.

Although the Proclamation has effect from 1st May, 1913, all owners of bees are afforded opportunity to arrange for the transfer during the present swarming season, and the section of the Act which prescribes a penalty not exceeding £20 for failure to comply with the provisions of the Act will not be enforced until every owner has had time to conform thereto.

In order to effect the change with as little inconvenience as possible, hives with frames having starters (narrow strips) or full sheets of comb foundation fastened to the centre line of the top bars, should be in readiness so that all swarms which issue may be hived in such.

Transferring at Swarming Time.

When a swarm has settled (or clustered), it should be hived in an ordinary empty box, and, as soon as the bees are in, carried to the spot which the frame hive is to occupy.

Towards evening, when the bees are not likely to rise in the air again, the frame hive is placed in position, a bag or cloth spread out in front of the hive entrance in such a way as to provide an easy passage-way into the hive, and the swarm shaken or dumped out of the box on to the cloth. If the bees are slow in entering the frame hive or a considerable number remain outside, they may be gently driven in by blowing a little smoke on them; none, however, should be blown into the hive.

What to do with the box hive from which the swarm came will depend upon whether an increase in the number of hives is desired or not. If no increase is wanted, the bees remaining in the old box may, after turning it open side upwards, be drummed up into an empty box placed on top (as in robbing box hives), and the bees thrown down in front of the frame hive containing the swarm.

The contents of the box hive may now be disposed of in the way usual with box hives. The combs will contain a considerable amount of brood (much more than when box hives are robbed at the usual time), and the many thousands of young bees, which would in the ordinary course have hatched within the following three weeks, may be saved if, instead of drumming the remaining bees off at once, this operation is deferred for twenty-two days, to allow all worker brood to hatch out. By this time there will be a young fertile queen, and the bees, after being drummed off, are hived on frames in the same way as the swarm, if increase is desired, or, if not, the old queen which went with the swarm may be removed from the frame hive and the driven bees with the young queen united with the bees of the frame hive by running them in towards evening after blowing a puff of smoke into the hive.

When re-uniting, as described, is intended, it is best to hive the swarm, in the first instance, on the spot occupied by the box hive from whence it came and place the old box alongside, with the entrance facing in a different direction from that of the frame hive. This will serve two purposes—first, the old bees which remained in the box after the swarm left it, when returning from their foraging flights, will go to the spot they are used to and join the swarm, with the result that no after swarm will come from the box hive; and, secondly, there will be no bees flying back after uniting, as would be the case if the new and the old hive were some distance apart.

Transferring at Robbing Time.

All hives do not swarm every year, and there may be a number still left in box hives when the swarming season is over. These may be

transferred at the time usually selected for robbing by box hive bee-keepers. At this time, which varies in different localities and seasons, there is generally a maximum of honey and a minimum of brood, so that the saving of it is of no great consequence, and the transfer is best effected by robbing the boxes in the usual way, but putting the bees into frame hives instead of empty boxes. If any of the stocks are too small, two may be put together into one frame hive. As far as possible, adjoining boxes only should be united, otherwise the bees which had their hive taken away altogether will enter the hive nearest their old location. Hives which did not swarm during the season, and particularly those which are weak in bees, may be suspected of disease. The box should be raised on one side and a piece of brood comb broken out, the box lowered again, the comb taken indoors and carefully examined for foul-brood. This is done by removing the caps of some of the brood cells, especially those which look darker than the surrounding ones, and any that have sunken in instead of raised caps. This pricking open of the cells should be done with a toothpick, a wooden match, or straw. Healthy larvæ are of pearly whiteness and plump; diseased ones are yellowish, grey, or brown, and flabby in appearance, and, later, collapse into a shapeless brown mass, which, when touched with a match, draws out stringy or ropy. This disease is often, but not always, accompanied by an odour of stale glue.*

Any colony found diseased and with not sufficient bees left to form a medium swarm should be at once destroyed by burning the box, bees, combs, and all. The bees should be shut in when they have stopped flying for the day, and the whole hive burned on a fire in a hole dug for the purpose, which is to be filled up with earth when everything is consumed.

If a diseased hive still contains sufficient bees to form a swarm, they may be drummed off into an empty box, in which they should be left for three or four days to cleanse themselves. The bees are then transferred to a frame hive like an ordinary swarm. The old box and contents should be burned as soon as the bees are driven out, and the intermediate hive cleaned by immersion in boiling water.

Robbing box hives for the purpose of transferring the bees to frames should not be done too late in the season, so as to give them a better chance to establish themselves before winter.

On no account should honey or comb, wax, or refuse from the box hives be given to the bees, nor should they be allowed to have access to it. The cutting out of combs, the straining of honey, and the rendering of wax should all be done indoors, secure from bees, or when that is not possible, it should be done at times when bees are not flying and all honey, wax scraps, or daubed utensils should be removed, or carefully and securely covered up, when the work is finished.

It may here be pointed out that the practice of many box hive bee-keepers of leaving comb too dark for the straining bag lying about, straining honey out of doors, or even purposely putting scraps of comb and sticky refuse out for the bees to clean up, has, since foul-brood has been introduced to Australia, caused the loss of thousands of

* For symptoms of Foul-brood and its treatment see *Journal of Agriculture*, June, 1913, page 367, or apply for pamphlet "Foul-brood of Bees," posted free on application to the Department of Agriculture

colonies of bees and the wholesale dissemination of that disease. Even the bees' nests in trees first became infected in this way. The subsequent felling and robbing of bee trees by bee hunters, who left the refuse exposed to other wild bees, box hive, and frame hive bees, caused a still wider distribution of foul-brood.

It is not natural for bees to find honey. They gather nectar from the blossoms; this they transform into honey inside the hive. When they find honey outside they become excited; when the supply is exhausted they forage around for more; they find weak, usually diseased colonies, or bee trees, somewhere within their range of flight; they attack these and carry home their stores of honey, and with them the germs of foul-brood.

If feeding bees is necessary, as it may be in the case of late transfers, sugar syrup (2 sugar to 1 boiling water by weight) should be given in a feeder inside the hive, not honey outside. Sugar syrup does not excite bees so much as does honey, and can be relied upon as being free from disease.

Transferring Bees and Combs.

Any one who understands bees well, and has sufficient experience in disease to enable him to detect the very first trace of it, can transfer box hive bees to frames at any time during the active season by cutting out any of the combs of brood in the box hive which are straight enough and fitting them into frames. The pieces of comb are held in position either by means of string tied over the frame and comb, or thin splints of wood tacked to the frame. These temporary supports may be removed as soon as the bees have fastened the combs to the frame. It is seldom that more than two or three frames can be filled with brood from a box hive; the rest of the frames are supplied with starters or full sheets of foundation. As the bees become established on newly-built combs the frames of transferred combs are gradually worked to the outside of the cluster of bees, or put into the upper story over a queen-excluding honey board, and when all the brood is hatched out of them they are best withdrawn from the hive and melted for wax.

While this method saves most of the brood and transfers everything in one operation, it is a very messy one. There is always a risk of transferring disease to the new hive along with the brood or comb, and the transference of brood and comb should, therefore, not be undertaken by any one not possessed of the requisite knowledge and skill.

(To be continued.)

Correction.

On page 569, *Journal of Agriculture* for September, 1913, "Yields and returns of the Government Herd of Red Poll Dairy Cattle." The third column of test figures should be read "Milk in gallons" in each case. Also, the average value for season 1912-13 should be £11 16s. 5d. —Editor.

PRINTED LABELS AND WRAPPERS FOR EXPORT FRUIT.

J. G. Turner, Chief Horticultural Officer.

The use of plain and coloured labels and wrappers in the packing of export fruit has long been a prominent feature of the American and Italian trade. Under the keen competition that exists in those older fruit-growing countries, every device for arresting the attention and securing the trade of the world's markets has long been resorted to. The shipper with the best eye for advertisement has scored over his rivals, and, accordingly, we find that his success has been, in nearly every instance, coincidental with the attractiveness of his advertisement. On American apple boxes, or in the Italian lemon cases received in Australia, we find some of the highest examples of the advertising art. The American shipper usually presents on the end of each fruit case a pictorial representation of his orchard or his district in colours that throw quite a glamour of beauty over the most commonplace details of every-day orchard life. The Italian packers place within their cases a printed cover presenting to the eye of the buyer a symphony in gold and colours; every fruit in the top row of the case is enveloped in tissue paper setting forth the name and address of the shipper printed in purple and gold, or other colours, and the lower layers are wrapped in papers printed in colours of, perhaps, humbler hue, but little less effective in the way of advertisement.

We in Australia have not yet reached so high a pitch of pictorial "push" in connexion with our wares; at any rate as far as our fruit is concerned. It is, perhaps, because we, so far, have enjoyed a comparative monopoly of the trade in our goods in the Old World markets. But the signs are not wanting that ere long we will have to face the competition of countries who are just as favorably situated as ourselves. South Africa and South America have been recently planting enormous areas of fruit trees. This can be for only one purpose. It, then, is clearly our duty to give more attention to the matter of advertising our goods than we have done in the past. The present methods (dull stringy-bark cases and plain paper wrappers) are, no doubt, virtuously economical, but the average cases sent from Victoria are quite innocent of trade embellishment—even to severity. The wrappers enclosing the fruit are almost invariably devoid of the slightest attempt at advertisement.

It is usually pleaded that advertisement, or any other suggestion, "all adds to the expense," and "every farthing counts." If expense be the objection, it should be easily got over. Why not co-operate? This item of advertising is one that could be very well taken up by the growers of each district packing at one packing-house. In fact, it is at the district packing-house that such a form of advertising would be best carried out, for it is mainly in conjunction with fruits of uniform grade and the best quality that a high repute for reliability for the output of the whole district can be attained. One or two careless indifferent packers in a district may easily nullify the efforts

of well-intentioned careful packers. Buyers, and officials too, sometimes, are, unfortunately, largely led by the locality influence. It is well known that all fruits, whether from Tasmania, New Zealand, or Australia proper, are regarded by many of the foreign buyers as "Australian." The German authorities some years ago issued regulations aimed at all Australian fruits, because in one small lot the officials found traces of San Jose Scale. At San Francisco, too, the officers caused restrictions to be placed on Australian fruits because of the existence of fruit fly at certain northern ports in the Commonwealth. This all tends to illustrate the necessity for advertising locality. If your locality is one of the best for raising top-grade fruit, make the most of it and advertise.

On this subject the Agent-General has forwarded to the Minister for Agriculture a report which he received from Mr. N. W. Barratt, who has been inquiring into this matter of fruit wraps:—

Sir,

In accordance with instructions, I have interviewed various buyers, both at Covent Garden and London Bridge, with regard to the use of printed fruit wraps.

There is a general consensus of opinion that anything that will set the fruit off to better advantage is very desirable, since it is the first glance at the auction sales which impresses buyers. In fact, as one well-known buyer expressed it, "Anything which looks well and tends to a certain amount of deception in catching the eye causes a ready sale." And there is nothing like a well-packed case. If the fruit be packed in a paper printed in a design, and with a colour which will not obscure the actual fruit, the same is very effective. Of course, some of the lighter colours are not very noticeable, such as the silver and burnished wrappers used on lemons.

I have seen a wrapper printed in bronze blue, which is on a white background. This is used for a good class of orange coming from Italy, and is very effective.

The two best colours to work in designs on printed wraps are bronze blue and red. Both of these should be used on a white background.

With regard to Californian fruit, printed wrappers are universally used.

Some Australian fruit from Western Australia and Tasmania has been sent in these wraps, and the buyers noted same immediately, with the result that the brand, being easily recognised (and the fruit good), has attained a great degree of popularity. Of course, if printed covers are used, the fruit should only be of the best, as otherwise nothing would be gained—the wrapper (printed) thus being recognised as a distinctive mark of quality.

With regard to the matter to be printed on a wrapper, various ideas have been suggested, *e.g.*, map of Victoria, with red dot on the part of the country from which the fruit comes. (This design is in use by a Tasmanian grower.) Then various lettering could be employed, such as "Finest grade fruit, best in the Colony or State," or "From Happy Valley Orchards," &c., or any such phrases which would be likely to catch the public eye.

The buyers here always forward the fruit with the wrappers on. These are often retained even by the shopkeepers, as anything wrapped in fine paper with a coloured design lends the idea that it is extra special.

Of course, there should be no indiscriminate use of the wrapper. It should be only used in connexion with the best class fruit. Otherwise, if buyers find that poor class fruit, or an inferior variety, is being packed, its effectiveness will be lost at once. An idea which has been suggested as a further means of advertisement is the use of a gaily-coloured card to be placed on the top of the fruit inside each case. This could be made either the size of the top of the case or smaller. This greatly adds to the finish in the packing. When the case is opened, the first thing seen is a bright design distinctive of the country of origin, with any choice lettering suggestive of the locality. This

immediately catches the eye, and has a good impression with buyers, besides giving the case a finished appearance. And, as previously stated, what is presented at auction with a pretty appearance will sell more readily than the less finished article. Because the buyer only gets a momentary look, and the idea left with him is that if a case is well finished off, the fruit must be of a fine quality.

I enclose such a card as is being used by a Californian grower whose plums are famous here.

Again, this card should be made of a firm material, so that it would be removed from the case and hung in a conspicuous way in either warehouse or shop. There is no doubt of the popularity of the idea.

In conclusion, the idea of printed wrappers seems to be popular, but the use must be restricted to best variety fruits, and the Government would do well to be able to guarantee same—this could be done by grading under Government inspectors.

I annex various wrappers and cards for inspection.

Your obedient, Sir,
(Sgd.) N. W. BARRATT.

The Agent-General for Victoria,
The Strand, 22nd May, 1913.

[Note.—The cards and wrappers referred to in Mr. Barratt's letter may be inspected, upon application, at the office of the Exports Superintendent, Department of Agriculture Produce Offices, 605-607 Flinders-street Extension, Melbourne.]

A NEW STRAWBERRY PEST.

The Metallic Flea Beetle (*Haltica pagana*).

By C. French, Jun., Government Entomologist.

During the last few months, strawberry growers in the Wandin and Evelyn districts have complained of losses through the depredations of insects, which are small in size, measuring about one-eighth of an inch in length, and of a purple, metallic colour. They swarm in great numbers on the strawberry plants, and make numerous small holes in the leaves and the young flower buds, causing them to wither. On examination, I found that the trouble was caused by the Metallic Flea Beetle, a native insect which formerly fed on the leaves of the "Sheep Burrs" (*Acaena ovina* and *A. sangiusorbae*). This is another example of our native insects forsaking their natural food and attacking introduced plants. As raspberries, apples, pears, &c., belong to the same order of plants (*Rosaceae*) as the "Burrs," growers should keep a sharp look-out for these insects, as there is no telling what trouble they may cause.

Remedies.

Fortunately, in the arsenate of lead spray we have an excellent remedy for the destruction of these insects, but this mixture should not be used whilst the plants are fruiting. A deterrent such as benzole emulsion could be used. Kerosene emulsion is also a useful spray. Numbers of these insects could be shaken off the plants into shallow tin dishes containing some sticky substance.

THE CENTRAL RESEARCH FARM, WERRIBEE.

The Cabinet Committee, which reported in 1911 on the reorganization of the Department of Agriculture, recommended, as one of the means by which the Department could best advance the agricultural industry, the undertaking of a centrally-situated Government farm. The specific purpose of such farm is set out below, but the Committee specially desired that a feature of the project should be permanency of the experimental work, whereby the error effect of varying seasons and climate might be eliminated. In this respect it was designed that the Central Research Farm should stand to Victorian agriculture as the Rothamstead Station in England, and the State Experimental Stations in United States of America, stand to British and American agriculture respectively.

It was also recommended by the Committee that the Central Farm should constitute the hub of a system of district farms, the work at which should be of a character special to the district in which they were situated. The idea was that ultimately, during the next ten, or possibly fifteen, years, six or seven of such district farms should be established, one in each of the climatically different districts of the State. For the then present, however, it was recommended that efforts should be concentrated on the Central Farm and the district farms already held by the Department, viz.:—the Rutherglen Viticultural College Farm (900 acres) for the North-Eastern district, and the Wyuna Irrigation Farm (500 acres) for the Goulburn Valley district.

Accordingly, arrangements were made to take over from the Closer Settlement Board an unallotted portion of the Werribee Estate.

In a foreword to a guide-book issued on the occasion of the first Farmers' Field Day at the farm, the Hon. the Minister of Agriculture (Mr. Geo. Graham, M.L.A.) intimated to visiting farmers as follows:—

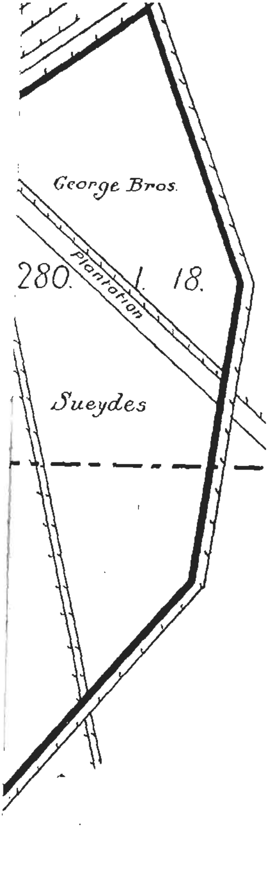
My impressions on two recent visits to the Central Research Farm were such that I felt it advisable that the farmers of the State, in whose interests the farm has been undertaken, should have an opportunity of knowing, by personal inspection of the work on the farm, one of the methods by which the Government proposes in future to promote the progress of agriculture, viz., the carrying out of accurately-controlled experiments and scientific researches, and the practical demonstration of such of the results as appear to warrant departure from present agricultural methods and practices. Furthermore, the Director of Agriculture (Dr. S. S. Cameron) and his able lieutenants, Mr. A. E. V. Richardson (Agricultural Superintendent) and Mr. H. C. Wilson (manager of the farm) were desirous that an account of their stewardship should be given to practical agriculturists, men whose assistance, support, and appreciation are necessary to the successful continuance of the work, and so I decided to inaugurate a Farmers' Field Day on the farm, which, I trust, may be found sufficiently interesting as to warrant its repetition as an annual event.

It should be remembered by visitors that only one season's work has been put in on a previously bare and uninviting area of land. With the exception of the established lucerne on the irrigation area, no results can yet be pointed to, but sufficient of the lay-out and developmental work can be seen as to indicate the objectives aimed at, and the capacity of the officers to carry out in a practical fashion the schemes they have initiated.

I have a confident trust that visitors will see much to interest them, and that their impressions will be such as to encourage the staff to continue the work and maintain its first year's workman-like standard."

GEORGE GRAHAM,
Minister for Agriculture.

"th September, 1913.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CENTRAL RESEARCH FARM, WERRIBEE.

The Purpose of the Farm.

The Central Research Farm is being established to provide for permanent use by the Department of Agriculture, a farm on which to carry out research work, experiments, and practical demonstrations in all branches of agriculture and live-stock husbandry.

The work carried out will reflect the teachings and experience of the staff of the Department, and will be designed in its results to insure the promotion of sound and advanced agricultural practice suitable to the present and probable future circumstances of the State.

The purpose of the farm is not to attain financially profitable results so far as the farm itself is concerned, but to confer on agriculture the benefits of modern scientific advances by the prosecution of investigations and trials under practical and accurately-recorded conditions concerning the problems involved in increasing the agricultural output of the State, particularly as regards—

(*a*) Improvement of wheat and other cereals, grasses, and economic plants by selection, stud-breeding, and hybridizing;

(*b*) Soil renovation, fertilizing and tillage methods;

(*c*) Rotation of crops and improved cropping practices;

(*d*) Irrigation practices; drainage and aeration of soils;

(*e*) Improvement of natural pastures, and trials of artificial grassing with exotic and native grasses;

(*f*) The breeding and feeding of live stock, improvement of milk yields, production of standard export types of lambs.

(*g*) Research concerning soil moisture, temperatures, biological conditions, and nitrification processes; and the nutrition of plants;

(*h*) Meteorological observations relating to agriculture.

Location, Area, and Character of Soils.

The location has many advantages. The handiness of the area to Melbourne (18 miles), whereby close touch by the Department is facilitated, and easy access by farmers from all parts of the State is afforded; its proximity to Werribee railway station (1 mile), the long stretch of observation obtainable from the railway and Geelong-road, the fact that both dry farming and irrigation areas in proper proportion, as also comparatively good land and definitely poor land are included; all these are combined advantages that could not be secured elsewhere in the State. Much of the soil closely resembles in physical character and chemical analysis that of the Goulburn Valley and Wimmera cereal-growing districts, and the annual rainfall (19.5 in.) is practically the same.

The area of the farm is 1,167 acres, of which approximately 837 acres is poor to fair (grey-blue pug clay and shallow red stoney loam), and 330 acres fair to good (red volcanic loam 6 to 7 inches) overlying clay). About 200 acres of the latter land is irrigable, and commanded by the main farm channel.

The bulk of the land has been cultivated for many years past for growing oaten hay, and is in a worn-out condition—certain of the best land is known to have grown a crop continuously without a rest for the last 26 years. The deficiency of humus, indicated by the floury character of the soil after dry cultivation, and the hard setting on drying after rain, is also made apparent by the contrast between the paddock soil and that on the removed fence lines.

Subdivision and Developmental Work.

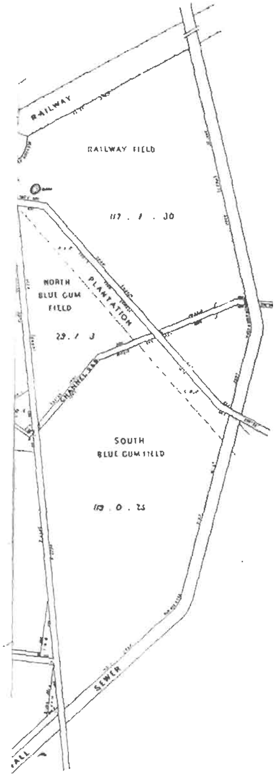
Possession was taken from the Closer Settlement Board on 1st July, 1912. At that time the area comprised five large paddocks of irregular shape (see Plan A). Plan B shows the subdivision in course of being carried out. Primarily the area is divided by north-south and east-west roads into four divisions, designated respectively N.E. (north-east), N.W. (north-west), S.E. (south-east), and S.W. (south-west). The plan provides for the further subdivision of these areas into paddocks, 30 of which have been already surveyed and fenced. Upwards of 25 miles of fencing have been erected during the year. The paddocks are for the most part rectangular in shape, and comprise areas of 10 acres or multiples of 10, in order that calculations and comparisons of crop yields may be facilitated.

In subdividing the farm, attention has been paid to securing, as far as possible, an even quality of soil for each set of permanent experiments, and also to the balancing of distances in relation to the farmsteading, which occupies a site on the highest level, and has drainage falls in two directions.

During the first year the developmental work has been directed to the provision of a water supply by the scooping of a small lake and silt dam, the formation of roads, the subdivision of the property by fences, the construction of water channels, the planting of shelter belts, and the ploughing, cultivation, and sowing of 550 acres of crop, comprising wheat, oats, barley, lucerne, peas, vetches, rape, mixed forages, and grass. Sixty-five acres of land have been graded, and of this 50 acres have been sown to lucerne, whilst 15 acres are reserved for summer crops. Two hundred acres have been fallowed for 1914 cropping, and another 100 acres are being undertaken, leaving, approximately, 310 acres devoted to pasture, plantations, roads, and steading.

Lay-out of Experiment Work.

As previously indicated, the main function of the farm is that it shall serve as a centre for the conduct of experimental and research work bearing on agricultural practice, but of course a large amount of pioneering work necessary to get the place in order for these purposes has had to be done. Nevertheless, a lesson of some kind has been designed in every field dealt with.



LAN SHEWING LAY OUT OF FARM
DIVISIONS (N.W) FIELDS (1) FARM ROADS
PLANTATIONS AND CHANNELS

The principal experiment work undertaken comprises:—

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(*f*) Rate of liming, 1912, 4 acres
(*g*) Inoculation and liming trials, 1912, 10 acres

Section 11.—Summer crops (Field 2, S.W.), 15 acres, ploughed for millet, sorghum, and maize

Section 12.—Subsoiling for grading (Field 9, S.E.)

DETAILS OF EXPERIMENTAL WORK—DRY FARMING.

Section 1.—Permanent Rotations, Field 3, S.W.

(See Plan C, page 597.)

These comprise for 1913 a series of 26 half-acre plots, designed to test the merits of different systems of cropping under the conditions which prevail in the district. This series of plots may be described as a test of different systems of farming. For the present, ten different systems of crop rotation have been commenced, but provision has been made for the addition of further rotations next season. These plots are to be permanent, and comprise the following:—

NOTE.—Oat plots, sown 10th April. 70 lbs. Algerian oats and 120 lbs. super per acre.

Pea plots, sown 11th April. Variety Tasmanian Grey. Seed, 75 lbs. per acre. Super, 120 lbs. per acre.

Barley, sown 11th April. 70 lbs. per acre. Super, 120 lbs.

Rape, sown 12th April. Dwarf Essex. 7 lbs. per acre. 120 lbs. super

Wheat, sown 15th May. 66 lbs. Federation. 120 lbs. super.

I.—*Wheat continuously*—Plot 1.

Plot 1.—Wheat 1913, wheat 1914, wheat 1915.

II.—*Wheat after Bare Fallow*—Plots 2 and 3.

Plot 2.—Wheat 1913,	bare fallow 1914.	
,, 3.—Bare fallow 1913,	wheat 1914.	

III.—*Wheat after Forage*—Plots 4-6.

Plot 4.—Wheat 1913,	rape 1914,	peas 1915.
,, 5.—Rape 1913,	peas 1914,	wheat 1915.
,, 6.—Peas 1913,	wheat 1914,	rape 1915.

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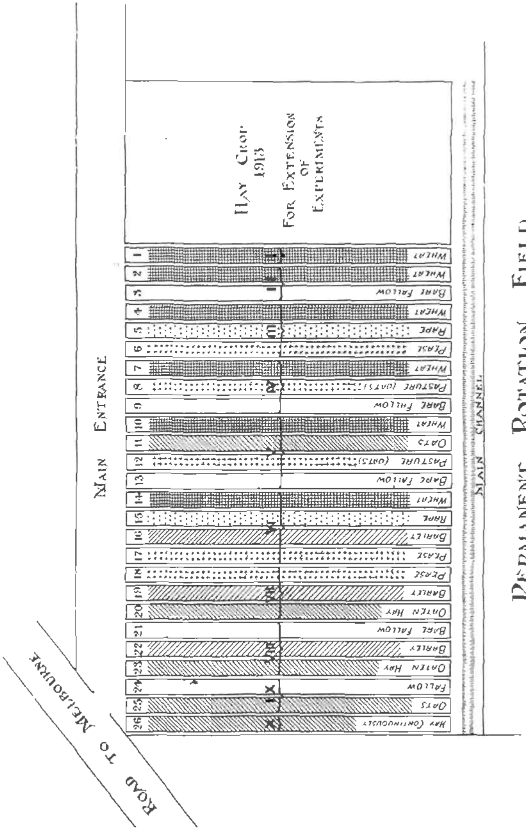
Plot 7.—Wheat 1913,	pasture 1914,	bare fallow 1915.
,, 8.—Pasture 1913,	bare fallow 1914,	wheat 1915.
,, 9.—Bare fallow 1913,	wheat 1914,	pasture 1915.

V.—*The Wimmera Rotation*—Wheat, oats, pasture, bare fallow. Plots 10-13.

Plot 10.—Wheat 1913,	oats 1914,	pasture 1915, bare fallow 1916.
,, 11.—Oats 1913,	pasture 1914,	bare fallow 1915, wheat 1916.
,, 12.—Pasture 1913,	bare fallow 1914,	wheat 1915, oats 1916.
,, 13.—Bare fallow 1913,	wheat 1914,	oats 1915, pasture 1916.



Permanent Rotation Field

Plan C

VI.—*Cereals after Forages*—Plots 14-17.

Plot 14.—Wheat 1913,	rape 1914,	barley 1915,	peas 1916.
,, 15.—Rape 1913,	barley 1914,	peas 1915,	wheat 1916.
,, 16.—Barley 1913,	peas 1914,	wheat 1915,	rape 1916.
,, 17.—Peas 1913,	wheat 1914,	rape 1915.	barley 1916.

VII.—*Oaten Hay after Forages*—Plots 18-20.

Plot 18.—Peas 1913,	hay 1914,	barley 1915.
,, 19.—Barley 1913,	peas 1914,	hay 1915.
,, 20.—Oaten hay 1913,	barley 1914,	peas 1915.

VIII.—*Oaten Hay after Cereals and Fallow*—Plots 21-23.

Plot 21.—Bare fallow 1913,	hay 1914,	barley 1915.
,, 22.—Barley 1913,	bare fallow 1914,	hay 1915.
,, 23.—Hay 1913,	barley 1914,	bare fallow 1915.

IX.—*Oaten Hay after Bare Fallow*—Plots 24-25.

Plot 24.—Bare fallow 1913,	hay 1914.
,, 25.—Oaten hay 1913,	bare fallow 1914.

X.—*Oaten Hay continuously year after year.*

Plot 26.—Oaten hay 1913, hay 1914, hay 1915.

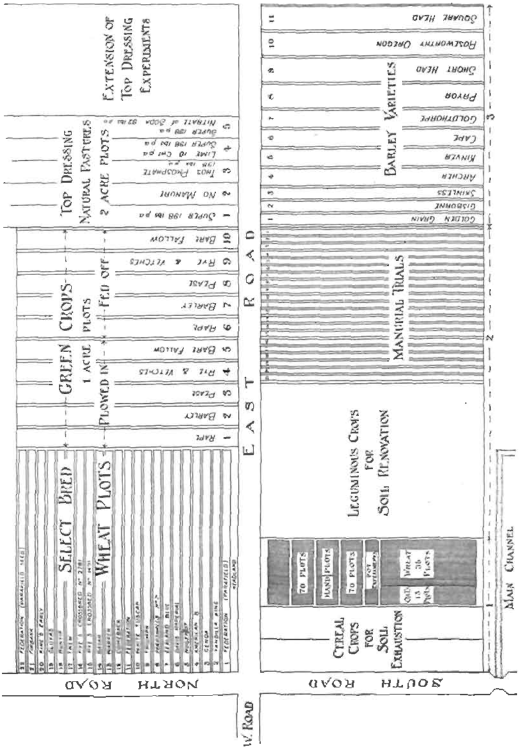
These plots are designed to test the merits of the different systems of crop rotation indicated, and the most profitable rotation will be that which enables the land to yield the best financial returns throughout a series of years. This will be determined by the keeping of accurate records, in which the cost of working each plot will be entered at current market rates, and it may be assumed that whatever holds true through a cycle of rotations on the Permanent Rotation Field will also be true if applied to, say, 100 acres.

Section 2.—Cereal Experiment Fields.

(See Plan D, page 599.)

(*a*) Cereal Stud, Selection, and Crossbred Plots (Field 1, S.E.).

These occupy about one and a half acres, and comprise a series of some 400 small plots devoted to stud wheats, barleys, and oats, and new crossbred wheats. A large number of selected cereals have been obtained, by exchanges, from Departments of Agriculture and Experiment Stations in the United States, Canada, Germany, India, and Russia, and these have been sown in small trial plots. It is anticipated that some of these, after acclimatization, will be of direct value and worthy of wider trial in the State. Thus one variety of wheat—American 8—which may be seen growing on the Select-Bred Wheat plots (Field 1, N.E.), under field conditions, has proved the best



Plan D.—Cereal Fields, 1913. 1, 2, 3 (S.E.), and 1, 2, 6 (N.E.). Central Research Farm, Werribee.

among 24 American varieties, and was a very prolific yielder at Rutherglen last season.

Besides these foreign wheats, a complete collection of standard Australian varieties has been sown. These form the stud plots for improvement by systematic selection and cross-breeding. Finally, a number of new crossbred wheats of different generations, are undergoing competitive trials, and have been sown in long rows. Check rows of Federation wheat have been sown at regular intervals for comparative purposes: 132 first generation crossbreds, 76 second generation crossbreds, and 82 fourth generation crossbred wheats are undergoing trials.

Pot Experiments to Determine the Water Requirements of Crops.

Within the railed enclosure in this section are a series of pot tests for determining the total amount of water required by wheat, barley, oats, rape, and lucerne at various stages of growth from germination to maturity. These pots are weighed regularly every week, and by calculation the exact amount of water utilized by each crop at each and every stage of its growth can be accurately determined. Incidentally these tests will demonstrate how much water must actually pass through the roots, stems, and leaves (by transpiration) of our common farm crops under Australian conditions in order to build up a given amount of dry matter—say, a ton of hay, or a 20-bushel crop of wheat. Check pots in fallow are provided for comparative calculations.

Meteorological Records.—(Located for the present in an enclosure on the south side of the manager's cottage.)—Within this enclosure may be seen the arrangements and instruments for taking the following meteorological records:—

1. Daily maximum and minimum air temperatures.
2. Daily humidity of the air.
3. Daily evaporation.
4. Maximum and minimum soil temperatures at a depth of 1 inch, 6 inches, 12 inches, and 24 inches.
5. Amount of bright sunshine each day.
6. Daily rainfall.

(*b*) PERMANENT FERTILIZER TRIALS (FIELD 2, S.E.).

(See Plan D, page 599.)

These comprise a series of forty plots in all, of which 21 are to be cropped in alternate years, and the remaining 19 either fallowed or sown with green crops. The plots are each ¼-acre in area, and are designed to be permanent, *i.e.*, the same manurial treatment will be continued on each plot for a number of years.

Nineteen plots are sown on fallowed land each year, whilst two are continuously cropped, and one of these continuously cropped plots will be unmanured and one treated every year with superphosphate.

The following table gives the scheme of the plots:—

Plot 1.—Super., 1 cwt. per acre.
 „ 2.—Farmyard manure, 10 tons.
 „ 3.—*Farmyard manure, 10 tons, and lime, 10 tons.*
 „ 4.—No manure.
 „ 5.—Super., ½ cwt. per acre.
 „ 6.—Super., 1½ cwt.
 „ 7.—Super., 2 cwt.
 „ 8.—Super., 1 cwt., and nitrate of soda, 49 lbs.
 „ 9.—Super., 1 cwt., and nitrate of soda, 49 lbs. (in spring).
 „ 10.—Super., 1 cwt. (check plot).
 „ 11.—Super., 1 cwt., and sulphate of potash, ½ cwt.
 „ 12.—Super. 1 cwt., *sulphate of potash, ½ cwt., and nitrate* of soda, ½ cwt.
 „ 13.—Bone fertilizer, 1 cwt.
 „ 14.—Thomas' phosphate, 1 cwt.
 „ 15.—Super., ½ cwt., and Thomas' phosphate, ½ cwt.
 „ 16.—Super., 1 cwt., and lime, 5 cwt.
 „ 17.—Super., 1 cwt., and lime, 10 cwt.
 „ 18.—Super., 1 cwt., and lime, 20 cwt.
 „ 19.—Super., 1 cwt. (check plot).
 „ 20.—No manure. (To be continuously cropped.)
 „ 21.—Super., 1 cwt. (To be continuously cropped.)

(Note.—Federation wheat sown on all plots, May 12-14th, 68 lbs. of seed per acre drilled with fertilizer stated below. *Plots 3, 16, 17, and 18 limed 1st May.*)

The permanent character of these plots make them more important than the usual fertilizer trials. On every occasion on which these plots come under crop, the manurial dressing applied to each will be the same. *The effects due to the different dressings of fertilizers will* become more and more noticeable as the years go by, and interesting changes in the fertility of the soil in the various plots may be looked for. Thus it will not only be possible to determine the immediate effect of the various fertilizers, but the cumulative effect as well,and the general influence of each fertilizer on the quality and stock-carrying capacity of the resultant pasture.

It will be noted that comparative tests are being made with different forms of phosphatic manures, also with nitrogenous, potassic, and farm-yard manures, and, in addition, the effects of varying quantities of lime and of water soluble phosphate are being compared.

(c) Barley Variety Tests (Field 3, S.E.).

(See Plan D, page 599.)

These comprise ten different varieties of pure-bred barleys, sown for the purpose of testing the suitability of each variety to the local conditions.

The varieties undergoing trial are:—Golden Grain, Gisborne, Skinless, Archer, Kinver, Cape, Goldthorpe, Pryor, Short Head, Roseworthy Oregon, Square Head.

(*d*) Select-bred Wheats (3rd Year Selection).

(See Plan D, page 599.)

This section comprises 22 plots of approximately ½ an acre each, with 20 varieties of select-bred wheats, obtained by careful hand-selection from pure-bred stocks. Three check plots of Federation have been sown for purposes of comparison.

The varieties are:—

Plot 1.—Federation (Parafield Seed).
,, 2.—Yandilla King.
,, 3.—Genoa.
,, 4.—American 8.
,, 5.—Huguenot.
,, 6.—Dart's Imperial.
,, 7.—Zealand Blue.
,, 8.—Marshall's No. 3.
,, 9.—Triumph.
,, 10.—White Tuscan.
,, 11.—Federation.
,, 12.—Comeback.
,, 13.—Warren.
,, 14.—Bayah.
,, 15.—Pye's Crossbred 1491 (Commonwealth).
,, 16.—Pye's Crossbred 2781 (Currawa).
,, 17.—Thew.
,, 18.—Bunyip.
,, 19.—Gluyas.
,, 20.—King's Early.
,, 21.—Firbank.
,, 22.—Federation (Parafield Seed).

(For notes on the characteristic qualities of these wheats see p. 606.)

The best of these varieties will be carefully harvested and sown in large plots next year for distribution to farmers.

Note.—These wheats were sown in May, at the rate of 65 lbs. of seed per acre, with 1¼ cwt. of superphosphate.

(*e*) Green Manurial Trials and Feeding-off Tests.

(Fields 1 and 2, N.E. See Plan D, page 599.)

The soils of this farm, in common with those of the older cultivated wheat lands of this State, have become depleted of much of the organic matter they formerly possessed by continuous cereal cropping. This is apparent not only from the increased difficulty of ploughing the old lands as compared with virgin land, but also by the fact that the virgin land is more productive than the cultivated land. A striking instance of this may be seen in the cereal fields where a strip of land 2 yards wide and 40 chains long, representing the virgin soil on each side of an old line of fence, is growing a remarkably heavy crop as compared with the depleted soil on either side of the old fence line. The de-

pletion of the organic content of the soil consequent on repeated cropping with cereals is a serious problem, and experiments are being undertaken in the green manurial and feeding-off tests to determine the most practicable means of restoring the soil to its former level of fertility. The depletion of organic matter can be arrested in three ways—(1) by the direct application of farmyard manure, (2) by the ploughing in of green crops, and (3) in feeding-off of forage crops and the ploughing in of the residue.

The application of farmyard manure as a means of achieving this object is generally impracticable, especially on wheat farms, since the average holding is so large in comparison with the amount of manure produced on the farm. Improvement by means of green manures and feeding off is within the range of economical practice, and the object of the tests in this section is to compare the values of these two methods of soil renovation, side by side with the orthodox bare fallow.

There are twenty plots of 1 acre each in this section, and in alternate years ten plots are to be sown in wheat and ten under green forages and fallow. Each of the forages used is grown in duplicate plots, of which one plot is regularly fed off, whilst the other is ploughed in. By alternating the ten forage plots with the ten wheat plots each year, comparative results will be obtained of the value of the wheat after each of the forages when fed off as compared with wheat following the same forages when ploughed in.

The following plots have been laid down in this section:—

Plot.	1913.		Plot.	1914.	
1.	Rape	Ploughed in	1.	Wheat	
2.	Barley		2.	"	
3.	Peas		3.	"	
4.	Rye and Vetches		4.	"	
5.	Bare Fallow		5.	"	
6.	Rape	Fed off	6.	"	
7.	Barley		7.	"	
8.	Peas		8.	"	
9.	Rye and Vetches		9.	"	
10.	Bare Fallow		10.	"	
11.	Wheat		11.	Rape	Ploughed in
12.	"		12.	Barley	
13.	"		13.	Peas	
14.	"		14.	Rye and Vetches	
15.	"		15.	Bare Fallow	
16.	"		16.	Rape	Fed off
17.	"		17.	Barley	
18.	"		18.	Peas	
19.	"		19.	Rye and Vetches	
20.	"		20.	Bare Fallow.	

NOTE.—Forage crops—Rape, barley, rye and vetches, and peas, sown on 8th and 9th April.

1. Rye, 70 lbs.; vetches, 35 lbs.; rape, 5½ lbs.; barley, 65 lbs.; peas, 75 lbs. per acre. Manure, 120 lbs. per acre.

The object of having the two fallowed plots in this section is to compare the crop of wheat obtained after forage crops ploughed in, and forage crops fed off, with the crop obtained after bare fallow. All the forage plots received a dressing of superphosphate, and, in order that any increased wheat crop obtained next year after these forages, as compared with the crop obtained from bare fallow, might

not be ascribed to the indirect influence of the superphosphate, one of these bare fallow plots (Plot 5) received the same dressing of superphosphate as that given to the forage crops, whilst the other bare fallow plot (Plot 10) was left unmanured for comparison.

Feeding-off Records.—While increased crops of wheat may result from the ploughing in and feeding off of forage crops, as compared with bare fallow or systems of continuous cropping with cereals, it would be of little advantage to the farmer if the increase of crop were insufficient to cover the extra cost of working the land. Accordingly, efforts are being made to estimate the exact value of the green forage fed off by conducting properly-controlled feeding trials with sheep, and placing the forage value against the increased cost of cropping. For this purpose, as many young sheep are turned on the plots as will properly utilize the fodder. The sheep are individually weighed on and off the plot, and the increase of live weight noted. For every increase of 1 lb., 1½d., say, will be allowed, according to the market value at the time. Further, an allowance of 1½d., say, per head per week for the wool will be made, irrespective of the increase in live weight.

As indicated above, the design of these plots is to demonstrate in what manner the organic matter of the soil (the most valuable soil ingredient) may be restored.

Section 3.—Grass Seeding Trial (Field 4, S.E.).

A 10-acre block has been laid down with permanent pasture grasses, comprising rye grass and clovers and prairie grass and clovers, sown May, 1913.

Section 4.—Top-dressing of Natural Pastures (Field 6, N.E.).

(See Plan D, page 599.)

The natural pasture on this farm is extremely poor and of low stock-carrying capacity. The quality of the natural herbage growing in any given district is largely dependent on the quality of the soil. Whether the stock-carrying capacity of the soil can be materially and profitably improved by top-dressing with various manures is the object of this experiment. At present five plots of 2 acres each have been laid down, comprising:—

1. Superphosphate, 2 cwt.
2. No manure.
3. Thomas' Phosphate, 2 cwt.
4. Lime, 10 cwt. and Super. 2 cwt.
5. Super. 2 cwt., and Nitrate of Soda, 1 cwt.

Provision has been made for extending the number of plots next season.

Section 5.—Legumes for Soil Renovation (Fields 1, 6, and 7, S.E.).

(See Plan D, page 599.)

In fields 1, 6, and 7 S.E., leguminous crops have been sown for soil renovation purposes. Though the winter has been extremely dry these crops have made fair growth, especially the mixed legumes in

1 (S.E.), in which a mixture of ½ bushel tick beans, ½ bushel vetches, ½ bushel peas were sown on 4th April. The contrast between the success of peas and other legumes wherever sown on the farm this season and the failure of rape wherever sown is most marked, and should constitute a very valuable object-lesson for local farmers.

Section 6.—Top-dressing Cereals with Nitrates (Field 2, N.W.).

On portion of the bulk hay crop nitrate of soda, 56 lbs., and sulphate of ammonia, 40 lbs., per acre have been applied as top-dressings to stimulate the growth of hay.

Section 7.—Fallow, 1913.

Fields 7 (60 acres), 8 (60 acres), and 9 (60 acres), N.E. have been ploughed for fallow, and it is proposed to fallow in addition Field 10 (60 acres) and the North Bluegum Paddock (40 acres). These paddocks have been ploughed with the mould-board and disc ploughs, and different depths of ploughing have been tried with each type of plough. The varying results, if any, on the crop to be grown on these fallows will be recorded at next year's harvest.

Section 8.—Lucerne for Pasture on Stubble (South Bluegum Field).

One hundred and three acres of oats for hay have been sown in five blocks with lucerne seed, at the rate of 6 lbs. per acre, according to the following scheme:—

Block 1.—(21.4 acres). This block was sown with Algerian oats at the rate of 2 bushels per acre, and after the crop was up the lucerne seed was broadcasted over with a Calhoun broadcaster, and the whole block rolled.

Block 2.—(21.4 acres.) This block was sewn with the same mixture of oats and lucerne; but in this case the lucerne seed was broadcasted on the crop immediately after the oats were drilled, and the whole block was then rolled.

Block 3.—(24.8 acres.) In sowing this block, the oats and lucerne seed were sown together with the superphosphate with the drill, and the seed was placed at a depth of about 1 inch, and then rolled.

Block 4.—(24.7 acres.) The oats, lucerne seed, and manure were sown with the drill, but the spouts were taken off, and the oats and lucerne allowed to drop from the box on to the soil. The whole block was then rolled.

Block 5.—(11.5 acres.) The same quantity of Algerian oats as on the other plots was drilled in on this block. No lucerne seed was sown.

The paddock on which these hay tests have been sown is one of the poorest on the farm, and its grazing value is very low. The object in sowing the lucerne with the oaten hay is to endeavour to increase the grazing value of the pasture after the hay crop is removed, and to assist in the process of soil renovation.

Section 9.—Bulk Wheats for Seed (Railway Field).

These comprise a series of eighteen varieties of wheat, sown in blocks varying from 2½ up to 10 acres in the Railway Paddock. These wheats may be seen from the railway carriage as it approaches the 18th mile-post on the eastern or bay side of the line.

The wheats in this series are true to type, and the yield is intended for distribution, in small lots, to farmers, so that plots may be sown by each to furnish his own bulk seed the following year. By so maintaining type, the deterioration of wheat varieties, which is continually noted, may be obviated.

The following is the order in which the varieties were sown on 19th to 22nd May:—

1.—Bobs—Produced by Farrer. An excellent milling wheat. Suited to coastal districts.

2.—Warren—This variety is suitable for both hay and grain, and is very prolific in the coastal districts of New South Wales.

3.—Marshall's No. 3—A very popular wheat, largely grown both for hay and grain.

4.—Gluyas—Very popular in the Mallee districts of South Australia, on account of its early maturity, its rust resistance, and drought resistance. A vigorous grower, but somewhat weak in the straw, and tends to grow down. Holds the grain well.

5.—College Eclipse—This is a variety of Carmichael's Eclipse, and is very much like Gluyas in its general characteristics.

6.—Penny—This variety yielded remarkably well on Tyrrell Downs last season.

7.—Yandilla King—This is a well-known late variety, with good stooling propensities, and is one of the best grain yielders.

8.—Dart's Imperial—This is one of the oldest varieties in cultivation at the present time. A good all-round wheat for grain and hay, and a heavy yielder in most districts. It is known more commonly as Bluey.

.—Viking—An early variety enjoying considerable popularity in Mallee districts.

10.—KING'S EARLY—A vigorous, tall-growing variety, with semi-solid straw, and of good stooling capacity. Very popular in the dry districts of South Australia. It is bearded, but in spite of its beard it is prized as a hay wheat, on account of the solidity of the straw, sweetness of the hay, and the capacity to retain its colour well.

11.—BUNYIP—A very early variety. A useful wheat to sow in dry districts when the season is late.

12.—BAYAH—A Farrer wheat very similar to Federation in colour and general appearance and the short upstanding straw. A very vigorous grower and a good yielder. Not suitable for hay.

13.—HUGUENOT—Originated by Corroll, of Western Australia. It is a wheat of the macaroni or durum class. Somewhat poor stooler, but very tall grower. The hay is solid in the straw, and very sweet in character. Has given exceedingly heavy yields of hay. Much relished by stock. Needs to be sown thickly.

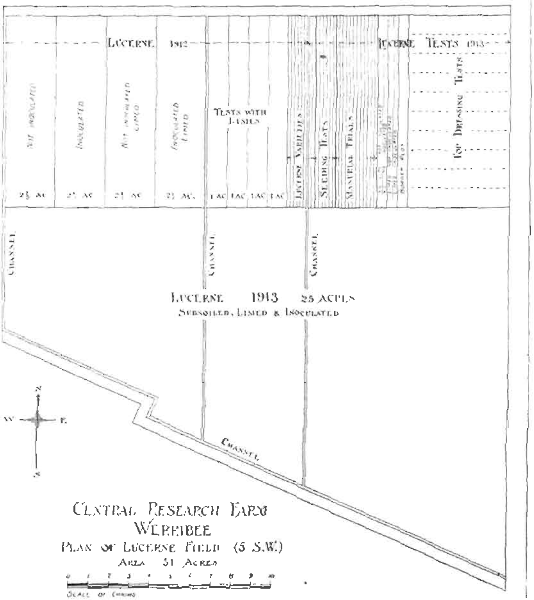
14.—AMERICAN 8—A vigorous tall-growing variety, of good stooling capacity. A very promising wheat, valuable both for grain and hay purposes. It is the best of the collection of American wheats introduced some five years ago. Gave excellent yields at Rutherglen last season both of hay and grain. Good milling quality.

15.—FIRBANK—One of the most popular hay wheats in the Riverina, and for some years past the demand for seed of this variety has been unprecedented. An early, tall-growing, erect variety, of moderate stooling capacity, and good heavy flag. Makes very good quality hay, and gives a heavy cut. A very rapid grower, and is suitable for hay in dry districts.

16.—GENOA—A late, smut-resistant, cross-bred variety, produced by Farrer. Gives a very heavy yield when the spring rains are heavy. Suited for the cooler districts of the State. Very late variety.

17.—ZEALAND BLUE—A very good hay wheat, produced by Berthoud, of Western Australia.

18.—FEDERATION — One of the most popular and prolific varieties of wheat cultivated at the present day. Extensively grown in Victoria, New South Wales, South Australia, and Western Australia. A cross-bred wheat produced by Farrer, Department of Agriculture, New South Wales. It is essentially a grain yielder, and is not suited or recommended for hay.


Lucerne 1912
Lucerne Tests 1913
Not Inoculated
Inoculated
Not Inoculated Limed
Inoculated Limed
Tests with Limes
Lucerne Varieties
Seeding Tests
Manurial Trials
Top Dressing Tests
2½ Ac.
1 Ac. 1 Ac. 1 Ac. 1 Ac.
Channel
Channel
Channel
Lucerne 1913 25 Acres
Subsoiled, Limed & Inoculated
Channel
N
W
E
S
Central Research Farm
Werribee
Plan of Lucerne Field (5 S.W.)
Area 31 Acres
0 1 2 3 4 5 6 7 8 9 10
Scale of Chains

IRRIGATION AREA.

Section 10.—Lucerne Field (No. 5. S.W.).

(See Plan E.)

This comprises an area of 50 acres, of which 15 acres were sown in October, 1912, and the remainder between August 21st and September 5th, 1913. This area has been laid out in rectangular checks to insure the thorough and even application of water and to facilitate harvesting. The distance apart of the check banks varies from half-a-chain to a chain, according to the varying fall of the land. The whole of the grading and channeling has been done by utilizing three simple home-made implements:—(1) The slicker; (2) the checkbanker, and (3) the delver.

The lucerne sown in 1912 comprises 15 acres laid out as follows:—

(*a*) *Inoculation and Liming Tests*—

Plot 1.—2½ acres subsoiled, not limed, not inoculated.
,, 2.—2½ acres subsoiled, not limed, inoculated.
,, 3.—2½ acres subsoiled, limed, not inoculated.
,, 4.—2½ acres subsoiled, limed, inoculated.

(*b*) *Lime Tests*—

Plot 1.—One acre, no lime.
,, 2.—One acre, 30 cwt. lime.
,, 3.—One acre, 20 cwt. lime.
,, 4.—One acre, 10 cwt. lime.

(*c*) *Variety Tests (One acre)*—

Spanish.
Hungarian.
Peruvian.
Turkestan.
French Provence.
Arabian.
Salt Lake City (sown September, 1913).
Patagonian (sown September, 1913).

The lucerne tests sown this season cover 5 acres, and comprise:—

(*d*) *Rate of Seeding Trials*—

Plot 1.—Tamworth lucerne, 6 lbs. per acre.
,, 2.—Tamworth lucerne, 9 lbs. per acre.
,, 3.—Tamworth lucerne, 12 lbs. per acre.
,, 4.—Tamworth lucerne, 15 lbs. per acre.
,, 5.—Tamworth lucerne, 18 lbs. per acre.
,, 6.—Tamworth lucerne, 21 lbs. per acre.

(*e*) *Fertilizer Trials*—

Plot 1.—Lime 20 cwt., super. 2 cwt., blood manure 1 cwt.
,, 2.—Lime 40 cwt., super. 2 cwt.
,, 3.—Lime 20 cwt., stable manure.
,, 4.—Lime 20 cwt., super. 2 cwt., nitrate of soda 1 cwt.
,, 5.—Lime 20 cwt., super. 2 cwt., sulp. of potash 1 cwt.
,, 6.—Lime 20 cwt.
,, 7.—Lime 20 cwt., bonedust 2 cwt.
,, 8.—Lime 20 cwt., Thomas' phosphate 2 cwt.
,, 9.—Lime 20 cwt., super. 2 cwt.
,, 10.—Ground limestone 36 cwt.
,, 11.—Nil.
,, 12.—Super. 2 cwt.

(*f*) *Inoculation and Liming Tests*, 1913—

Plot 1.—Not limed, not inoculated.
,, 2.—Not limed, inoculated with 1 ton lucerne soil.
,, 3.—Not limed, inoculated with 2 cwt. lucerne soil.
,, 4.—Limed, not inoculated.
,, 5.—Limed, inoculated with 1 ton lucerne soil.
,, 6.—Limed, inoculated with 2 cwt. lucerne soil.

The lucerne area sown this year, other than the plots devoted to "Rate of Seeding Trials," has been seeded at the rate of 16 lbs. per acre with 2 cwt. of super., and has been inoculated with soil from *Bacchus Marsh*.

(*g*) *Top Dressing of Lucerne*—

Comparative effect of lime, ground limestone, gypsum, superphosphate, basic slag, bonedust, lime gypsum, ground limestone, potassic manures, nitrogenous manures, farmyard manures.

Preparation and Grading of the Lucerne Area, 1913.

The land was ploughed and subsoiled out of oat stubble in January in lands one chain wide, the crown of the land being the line of the final chain-wide check banks. Autumn-grown weeds were grazed off with sheep in May, and in June the cultivation preparatory to grading was commenced.

The whole area has been laid out in rectangular checks to facilitate watering and harvesting. The main check banks have been set out 1 chain apart at right angles to the contours. These checks were made with a specially-constructed check-banker, which implement may be inspected in the lucerne field. The cross checks are placed at intervals of ½-chain to 1 chain at right angles to the main checks according to the amount of fall. The fall in the lucerne field varies from 2½ to 4½ inches per chain. This fall necessitated the employment of frequent check banks.

FARM LIVE STOCK.

Lamb-breeding.—Last season 318 crossbred Riverina ewes of uniform type and quality were selected from a large flock. Each ewe was given a numbered ear-tag and separately weighed. The flock was then divided into six separate and even-weight lots of fifty, with three emergency ewes in each group to replace possible deaths. Each group was then mated with a different ram, with the object of finding out the most suitable ram for the breeding of export lambs. The rams used were Lincoln, Border Leicester, English Leicester, Shropshire, South Down, and Dorset Horn. Each group of sheep was placed in separate paddocks, but, in order to insure equality in feeding, the sheep were moved from paddock to paddock in regular rotation through the season and kept separate until the marking of the lambs was completed.

The lambing percentages were generally satisfactory, but a number of lambs were lost on account of the bleak cold winds, and the absence of shelter on the farm. Careful records have been kept of the dates of lambing, percentage of lambing, rapidity of growth in each group of lambs, &c. It is proposed to send half the lambs in each group to the freezing works, so that the weight and the value of the carcase may be determined. The other half of each group of lambs will be sold in the local market with a view of determining the market value of each group of lambs.

The experiment will be continued during this and the following season, and averages for the three years will then be obtained.

Dairy Stock.—The dairy herd of Red Poll cattle established by the Department four years ago at Whitfield was taken into stock at Werribee in June last. The herd is at present held at Boisdale, but will be transferred to Werribee when the silage crops are harvested in November.

It will be recognised that the pasture land on the farm is not suitable for dairying by grazing, but with the irrigation produce and the conserved fodders, it is the intention to carry out hand-feeding on a modified plan, and to conduct various tests on the relationship of hand-feeding to milk yields. The sale of young bulls from standard record cows to Victorian dairymen at a price based on the butter fat yield of the dam will be continued.

Horses.—All the working horses on the farm are Clydesdale-bred mares. So far no special stud mares are held, but a Clydesdale stallion, "Major Oates," was purchased this season to use on the farm mares and a limited number of district mares.

SEEDLING POTATOES.

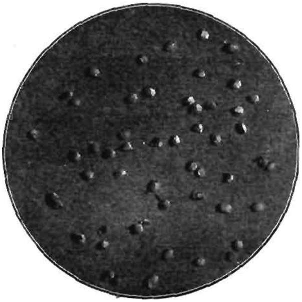
By Geo. Seymour, Potato Expert.

[Report on the results obtained from the six parcels of pedigree potato seed forwarded to the Minister of Agriculture by Dr. Wilson, of St. Andrew's, Scotland, who was a member of the Scottish Commission which visited this State in 1911.]

From the accompanying illustrations it will be seen that the plants made a very vigorous growth, and that the tubers were large and of good shape.

Six different crosses were comprised: most of them are the result of working a red-skinned variety, sent from New Zealand, on a number of British sorts. They were as follows:—

No. 88.—Main Crop (3), New Zealand variety (2).
No. 99.—Up-to-date, a New Zealand variety (2), Myatt's Kidney, Main Crop.
No. 128.—British Queen, Myatt's Kidney, Main Crop (2), New Zealand variety (2).
No. 139.—Main Crop (2), New Zealand variety (2), Myatt's Kidney.
No. 155.—Cramond Blossom, Main Crop, New Zealand variety.
No. 177.—British Queen, Main Crop, New Zealand variety.



POTATO SEED.

A few seeds of each variety were planted on 23rd February, 1912, in pots. Germination was very satisfactory. The plants were removed from the pots on 6th April, and planted in a well-prepared garden plot. Early autumn frosts and dry weather interfered with the growth, with the result that the tubers produced were very small. No definite information can be formed as to the value of these new varieties for a season or two. It may be stated, however, that the flesh of most of them is yellow. By 1st June, all the plants except Nos. 155 and 177 had ripened off. The two latter appear to be very hardy plants. They resisted the frosts better than the others. The whole of the plants were lifted on 27th June, when the following particulars were noted:—

No. 88.—Tubers round, colour white, late maturing, stolons long.
No. 99.—Tubers round, colour of potato white, medium early, stolons long.
No. 128.—One plant tubers, kidney shape, all others round, white, early.
No. 139.—Tubers all kidney shape, white, early, stolons very short.
No. 155.—Tubers all round, white, late, vigorous plant, resisted frost.
No. 177.—Tubers all aerial, white, very late, vigorous plant, resisted frost.

These crosses are based on some of the leading disease-resisting, early, and main crop varieties, grown at the present time in England. Main Crop, Up-to-Date, Cramond Blossom, Myatt's Kidney, are all standard varieties which have stood the test of years.

The points sought in raising a new variety are that it shall be—

A good cropper.
Of good cooking quality.
A good disease resister.

The work of raising seedling varieties is generally regarded as very tedious work, requiring to be carried on for several years before tubers

THE PLANTS.

of any size are obtained, but, in this instance, they were nearly all of a fairly large size, many individual tubers weighing 1 lb. in weight, and very uniform in shape, some plants yielding 3 and 4 lbs. of fine tubers. The plants, some of which grew to an enormous size, measuring 4 ft. 6 in. to 5 feet in height, and of very robust growth, were raised at Burnley Gardens by Mr. Pescott, and were planted out on 21st November in my garden at Romsey. The season at first was very dry. During this period the plants were supplied with water artificially, but the autumn rains were ample.

The resulting crop comprises Very Early, Early, Midseason, and all late sorts. The plants of all the earlier sorts were small to medium in size, and the yield of tubers comparatively light.

The percentage of yellow-fleshed tubers is as follows—

No.	Per cent.
88	20.0
99	17.1
128	38.6
139	20.0
155	26.0
177	20.0
	23.6

TIME OF MATURITY.

Each variety comprised Very Early, Early, Midseason, and late maturing sorts.

No.	Very Early and Early.	Medium, Early, and Midseason.	Late.
88	32	16	52
99	25·7 (Not very early, 1 medium)	2·9	71·4
128	27·3	13·6	59·1
139 ..	48·6	22·8	28·6
155 ..	17·4	8·7	73·9
177 ..	20	Nil	80
	28·5	10·7	60·8

SHAPE AND COLOUR OF TUBERS.

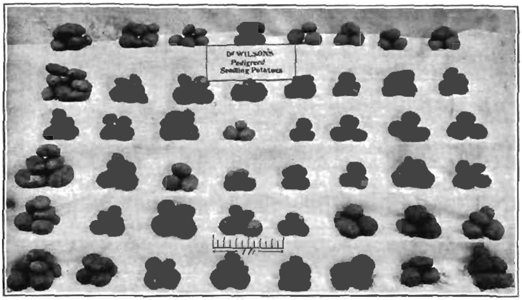
The tubers were various in shape—round, oval, and kidney shape, and true kidney. The following figures will show the percentage of kidney. Many of the plants had round and oval, and kidney and oval at the same plant. There was a marked absence of deep eyes. None of the varieties had very deep-eyed tubers.

No.	Percentage of Kidney.	Percentage of Pink Tubers.
	Per cent.	Per cent.
88	12·0	16·0
99 .	28·5	5·0
128	31·7	4·5
139 ..	37·1	3·0
155	27·2	21·7
177	13·3	0·0

With regard to the colour of skin, it should be stated that the ground was very wet when the crop was lifted, therefore many varieties that are classed as white skins may prove to be mottled with pink, or of a very pale pink.

Colour and Texture of the Flesh.

The percentage of white and creamy-fleshed tubers must be considered very satisfactory, in view of the fact that a yellow-fleshed potato does not find favour on the local market, whilst in France the preference is for a yellow flesh, and in England it is not objected to, because many of the finest flavoured tubers are yellow fleshed. Two of these may be mentioned—Duke of York (a very early variety), and Mid-



SEEDLING POTATOES.*

lothian Early. The former was imported by this Department in 1905, but, on account of inferior cropping capacity and yellow flesh, it never came on the market.

Stolons.

Among the objectionable features in potatoes is the habit of some varieties in producing their tubers on long stems or stolons, because when the tubers are scattered over a wide area around the plant, many are missed in harvesting the crop.

No.	Short Stolons.	Medium Stolons.	Long Stolons.
	Per cent.	Per cent.	Per cent.
88	68·7	24·0	8·0
99	50·0	25·0	25·0
128 ..	66·7	20·0	13·3
139 .	77·3	8·5	14·2
155 .	78·2	17·4	4·4
177 ..	73·3	20·0	6.7
Average ..	69·0	19·1	11·9

* See also illustration on cover of this Journal.

From the above it will be seen that the short stolons ranged from 50 per cent. to 78 per cent., with an average of 69 per cent. of all the varieties, and only about 11 per cent. were of the objectionable kind with long stolons.

SUMMARY OF POINTS.

COLOUR OF FLESH.

White and Cream.	Yellow.	Total.
Per cent.	Per cent.	Per cent.
76·4	23·6	100.0

EARLINESS.

Very Early and Early.	Midseason.	Late.	Total.
Per cent.	Per cent.	Per cent.	Per cent.
28·5	10·7	60·8	100·0

LENGTH OF STOLONS.

Short.	Medium.	Long.	Total.
Per cent.	Per cent.	Per cent.	Per cent.
69·0	19·1	11·9	100·0

From the yields obtained, it is evident that many of them promise to be very prolific. Over 76 per cent. have good coloured flesh. Any not perfectly white are listed as cream. The texture of the flesh is very fine in most of the medium croppers, but rather coarse in the heavy-yielding sorts.

Sixty-nine per cent. had the desirable short stolons, and about 12 per cent. with the undesirable or long stolons.

No cooking tests were made. It would be of little value at this stage. As there was no late blight in the crops, the season being unfavorable for its development, no data under this head can be supplied.

The foregoing results show that great care in the selection and breeding of the parent plants must have been exercised by Dr. Wilson, for, out of the 210 plants raised, only three were rejected on account of producing a large number of very small, wild-looking tubers, and six stoloniferous plants, which had a mass of stolons with very few tubers.

The results from these seedlings bear testimony to the great possibilities in the crossing of different varieties of potatoes. It is doubtful if better results have ever been obtained before with such a large quantity of seedlings. Many authorities state that it often requires the raising of thousands of plants to obtain one desirable variety. Of course,

it is premature to speculate on the number of good varieties that may be obtained from the present lot—the future alone can prove that; but from such a large percentage of tubers presenting so many good qualities, it is not too much to hope that some will prove prolific croppers, of good cooking quality, and prove more resistant to disease than any at present grown here. Should this be the case, the potato growers of this State will be under a debt of gratitude to Dr. Wilson.

It may not be out of place to include in this report Dr. Wilson's letter to the Minister of Agriculture accompanying the parcels of seed. By so doing, readers will have a better grasp of the scope of Dr. Wilson's work, and the objects he has in view in carrying on this work. And, further, it may not be out of place to mention that since the date of his letter he has been permanently appointed by the West of Scotland Agricultural College to the work of crossing and breeding new varieties of pedigreed potatoes.

(Copy.)

Agricultural Department,

The University, St. Andrews,

3rd January, 1912.

The Agent-General for Victoria.

When I was in Victoria as a member of the Scottish Agricultural Commission, I had occasion, at the instance of the Hon. G. Graham, and in company with Mr. McAlpine, to see the trouble that was caused by the existence of disease in potatoes. It so happens that I have been engaged for a considerable time in producing new varieties of potatoes, and during the past summer, when carrying on the work of crossing, it occurred to me that the best method of getting potatoes absolutely free from disease, and at the same time suited to the varying climatic and cultural conditions in Australia, would be to raise them from the seed taken from the berry.

I have accordingly made up sets of packets of seeds from my new varieties, with the object of sending selections to each of the States. The enclosed list will show that the seeds are "pedigreed." Each packet contains the whole of the seed taken from a single berry. If all the seeds are grown, they will produce a large number of varieties, of which a considerable proportion are certain to be of value to the Victorian grower.

The method of cultivation which I follow is to sow the seed in March in a pot, and place in heat. After the plants are large enough to handle, they are put singly into small pots. Re-potting is done at least twice, and the plants are planted out in the open in June, where they remain until they are matured. At lifting time, in September or October, each plant is found to bear 4 or 5 lbs. of full-sized tubers, and the less promising varieties can be eliminated then. Although the climatic and other conditions are quite different in Victoria, the foregoing may afford some guidance if it is needed.

It would have given me great pleasure to communicate this note direct to Mr. Graham, because of the recollections of pleasant hours spent in his company during our sojourn, and it would interest him to know that I am trying, in a small way, to make some recompense for the many benefits I received at the hands of the representative of the Department of Agriculture.

Please be so good as to forward the seeds.

I am,

Yours faithfully,

(Signed) JOHN H. WILSON.

RESULTS OF EXPERIMENTS CARRIED OUT WITH DR. WILSON'S PEDIGREED POTATO SEED.

By George Seymour, Potato Expert.

No. 88.

No.	Habit of Plant.	Colour of Flower.	Shape of Tuber.	Colour of Skin.	Colour of Flesh.	Time of Maturity.	Character of Stolon.	Remarks.
1	Small		Oval	White	White	Very early	Short	
2	Medium		,,	..	..	Midseason	..	Very fine tubers
3	Large		,,	..	,,	Late	..	
4	Medium		Round	Yellow	Cream	,,	..	
5	Large		Oval	White to cream	..	,,	Long	
6	Very large		,,	Light-pink	White	,,	..	
7	Medium		Kidney to oval	Pink	..	Very early	Short	
8	,,		Oval	White	..	Midseason	..	Tubers very nice
9	Very large	White	Round	..	Cream	Late	Medium	
10	,, ,,		,,	White netted	..	..	..	
11	Very large and wiry		Oval	Pink	..	,,	Short	
12	Large		Round	White netted	..	,,	..	Tubers very nice
13	Very large		Oval	White	Very white	,,	Medium	
14	Small		,,	..	Yellow	Early	..	
15	Medium		,,	..	..	Late	Short	
16	Very small		Oval and round	..	Cream	..	,,	
17	,, ,,		,, ,,	..	..	Very early	..	
18	,, ,,		Round and oval	..	Yellow	,, ,,	..	
19	Medium		Kidney	Pink	..	Medium	..	Bad coloured flesh
20	,,		Round, kidney, and oval	White	..	..	..	
21	..		Oval and round	..	Cream	Very early	..	
1 (a)	Large		Oval	..	White	Late	Medium	
2 (b)	Small		Round and oval	White netted	..	Very early	Short	
3 (a)	,,		Oval	..	..	..	..	
4 (a)	Large and very fine		Round	..	..	Late	Medium	

No. 99.

1	Very large and vigorous	..	Kidney and round	Very white	Very white	Late	Long	
2	Very large and vigorous	..	Oval and round	,,	,,	,,	Short	
3	Long and weak	..	Oval	,,	,,	,,	Long	
4	Large and vigorous	White	*Oval and round*	,,	,,	,,	Medium	
5	Medium	..	,, ,,	,,	,,	,,	Short	
6	,,	..	Oval	,,	White	,,	,,	
7	,,	..	Round	,,	*Very white*	,,	,,	
8	Large	Very pale-lavender	Oval	Light-pink	Yellow	,,	Long	Flesh pink, creamy white
9	Small	..	Round and kidney	White	White	,,	*Short*	
10	,,	..	Oval	,,	,,	,,	,,	
11	,,	..	,,	,,	,,	Early	,,	
12	Medium	..	,,	,,	Cream	,,	,,	
13	,,	..	Oval and kidney	,,	Yellow	,,	,,	
14	*Very large*	Lavender	Oval	,,	Cream	Late	,,	
15	,, ,,	..	Round	,,	Yellow	Early	,,	
16	,, ,,	..	Oval and round	Yellow	,,	Late	Very long	Stringy growth
17	Medium	..	Oval	White	Cream	,,	Long	
18	Very large	..	Oval and kidney	,,	White	,,	Medium	
19	,, ,,	..	,, ,,	,,	,,	Early	,,	
20	Medium	..	*Round*	,,	,,	,,	,,	
21	Small	..	,,	,,	,,	,,	Short	
22	Medium	..	Oval and kidney	,,	,,	,,	,,	
23	Small	..	Round and kidney	,,	,,	Late	,,	
24	Very large	White	Oval	,,	,,	,,	Long	Stringy growth
25	Large	Lavender	Kidney	,,	,,	,,	,,	
26	Medium	..	Oval	,,	*Cream*	*Early*	*Short and long*	
27	Very large and vigorous	..	Oval and kidney	,,	White	*Late*	Medium to *long*	
28	Large	..	Kidney and round	,,	Cream	,,	Medium	
29	,,	..	Kidney and oval	,,	White	,,	Short	
30	,,	..	,, ,,	,,	Cream	,,	Long	
31	,,	..	Oval and round	,,	Yellow	,,	,,	
32	Medium	..	,, ,,	,,	,,	Medium	Short	

RESULTS OF EXPERIMENTS CARRIED OUT WITH DR. WILSON'S PEDIGREED POTATO SEED—*continued.*

No.	Habit of Plant.	Colour of Flower.	Shape of Tuber.	Colour of Skin.	Colour of Flesh.	Time of Maturity.	Character of Stolon.	Remarks.
No. 99—*continued.*								
33	Very large and robust		Oval	White	Pink	Late	Medium to long	Flesh pink
34	Medium		,,	,,	White	,,	Short	
35	Very large and robust		,,	,,	Cream	,,	Medium to long	
36	Large		,,	Pale-pink	White	,,	Medium	Tubers large and numerous
No. 128.								
1	Small and wiry		Kidney and oval	Pink	White	Very early	Short	
2	Long and spindly		Round	Pink and white	,,	Late	Medium	
3	Very small		Kidney	White	,,	Very early	,,	
4	Long and spindly		Oval and round	,,	,,	Late	Long	
5	Small	White	Oval and kidney	,,	,,	Early	Short	
6	Large and spindly		Kidney and oval	White netted	,,	Late	Medium	
7	Very large and spindly	White	Oval	,, ,,	,,	,,	Long	
8	Very large and spindly		Round and oval	,, ,,	,,	,,	,,	
9	Large		,, ,,	White	,,	,,	,,	
10	,,	White	Kidney and oval	,,	Yellow	,,	Short	
11	Medium		Oval	,,	,,	Medium	,,	
12	Very small		,,	,,	White	Very late	,,	Tubers small—poor lot
13	Very large		,,	,,	,,	,, ,,	,,	Tubers very large
14	Large	White	,,	,,	,,	,, ,,	,,	Tubers fine and large
15	Medium	Pale-lavender	Round	,,	Yellow	Late	,,	
16	Small and weak		Oval	,,	White	Early	,,	
17	,, ,,		Oval and round	Yellow	Yellow	Very early	,,	

18	Very large	Lavender	Flat, oval, and *round*	White	Cream	Late	Medium to short	Very prolific
19	,, ,,	..	Oval	,,	Yellow	,,	Short	
20	,, ,,	..	Kidney and oval	,,	White	,,	,,	
21	Large	..	Kidney	,,	,,	,,	,,	
22	Very large	..	Kidney and oval	,,	Cream	,,	Long	
23	Medium	..	Oval and round	,,	White	Midseason	Medium	Tubers very numerous
24	Small	..	Kidney	,,	,,	Late	Short	Tubers few
25	,,	..	,,	,,	Cream	Medium	,,	,, ,,
26	Medium	..	Oval	,,	Yellow	,,	,,	Tubers large
27	Large—very	..	,,	,,	Cream	Late	,,	
28	Small	..	,,	Yellow	,,	Early	,,	
29	Very large	Lavender	,,	White	White	Midseason	,,	
30	,, ,,	..	,,	,,	Yellow	Late	Medium	
31	Medium	..	Oval and kidney	,,	Cream	,,	Short	
32	,,	White	Round	,,	Yellow	,,	,,	
33	,,	..	Kidney and oval	,,	Cream	,,	,,	
34	,,	..	Oval	,,	Yellow	,,	Long	Flesh bad colour
35	Small	..	Kidney	,,	,,	Early	Short	
36	Medium	..	Oval	,,	,,	Late	,,	
36 (*a*)	,,	..	,,	,,	Cream	Medium early	,,	
37	Small	..	Oval and kidney	,,	Yellow	Very early	,,	
38	Very large	..	,, ,,	,,	Cream	Late	Medium	
39	Medium	..	,, ,,	,,	Yellow	Very early	Short	
40	,,	..	Oval and round	,,	,,	Medium early	,,	
41	Large	..	Oval	,,	White	Late	,,	
42	Very large	..	,,	,,	Yellow	,,	Medium	
43	Small	..	Kidney and oval	,,	,,	Very early	Short	
44	,,	..	Kidney	,,	,,	,, ,,	,,	
No. 139.								
1	Small	..	Oval	Pink	White	Very early	Short	
2	,,	..	Oval and kidney	White	,,	Early	,,	
3	,,	..	Round	White netted	,,	,,	,,	
4	,,	..	Kidney and oval	,, ,,	Yellow	,,	,,	
5	,,	..	,, ,,	,, ,,	Cream	Very early	,,	
6	Large	..	Oval and round	White	White	Midseason	,,	Large and numerous

RESULTS OF EXPERIMENTS CARRIED OUT WITH DR. WILSON'S PEDIGREED POTATO SEED—*continued*

No.	Habit of Plant.	Colour of Flower.	Shape of Tuber.	Colour of Skin.	Colour of Flesh.	Time of Maturity.	Character of Stolon.	Remarks.
No. 139—*continued.*								
7	Large		Kidney and oval	White	White	Midseason	Short	
8	Small		Kidney	"	Cream	"	"	
9	Medium		Kidney and round	"	"	Very early	Very short	
10	"		Oval	"	"	" "	Short	
11	"		Oval and kidney	"	White	" "	"	
12	Very large		" "	"	"	Midseason	"	Large and numerous
13	Medium		Oval and round	"	Cream	Early	"	
14	Small		Oval	"	"	Very early	"	
15	Large		Round	"	White	Midseason	"	
16	Very small		Kidney	"	"	Very early	"	
17	Large		Oval	"	Yellow	Midseason	"	
18	Very large		Oval, round, and kidney	"	Cream	Late	"	Tubers numerous, some large
19	" "		Oval and round	"	White	Very late	Very long	
20	Small		Oval	"	"	Very early	Long	
21	"		Round	"	Yellow	" "	Short	
22	"		Kidney	"	"	" "	"	
23	Very large and robust	Lavender	Oval and round	"	Cream	Late	Long	
24	Very large		Oval	"	"	"	Medium to long	
25	Medium		"	"	Yellow	Medium	Short	
26	Very large and robust		"	"	White	Late	Medium	Large and numerous
27	" " "		"	"	Cream	"	Long	" "
28	Medium		Oval and kidney	"	White	Very late	"	" "
29	Very large and robust	Lavender	Oval	Pink	"	" "	Medium	Tubers pale-pink, nice appearance
30	Small		"	White	Yellow	Early	Short	
31	"		"	"	Cream	"	"	
32	Medium		Oval and kidney	"	"	Medium	"	
33	Very small		Kidney	"	Yellow	Very early	"	
34	Large		Oval	"	Cream	Late	"	
35	Large		Oval and kidney	"	"	"	"	

No. 155								
1	Very large	.. ..	Kidney and oval ..	Pink and white	Cream ..	Late ..	Short ..	Plants fine, stalks pale-green, *some* tubers very large
2	Small	.. ..	Kidney	White ..	.. ..	.. ..	,,	
3	Very large ..	.. ..	Round	Pink and white	,, ..	Very *late* ..	*Short to* medium	
4	Medium	.. ..	Oval	.. ..	.. ..	Midseason ..	Medium	
5	Medium—spreading	.. ..	.. .. ..	White ..	.. ..	Late ..	*Short*	
6	Small	.. ..	.. .. ..	,, ..	Yellow ..	.. ..	..	
7	Very large ..	.. ..	Oval and round ..	,, ..	.. ..	.. ..	..	
8	Medium	.. ..	Oval and kidney ..	,, ..	.. ..	.. ..	..	
9	.. .. ..	.. ..	Round	.. ..	.. ..	.. ..	..	
10	Small	.. ..	Kidney and oval ..	Pink to white	.. ..	Early ..	..	
11	.. .. ..	.. ..	Oval and *round* ..	White ..	Cream ..	.. ..	..	
12	.. .. ..	.. ..	Kidney and round	.. ..	.. ..	.. ..	..	
13	.. .. ..	.. ..	.. .. ..	.. ..	.. ..	Late ..	Medium	
14	Very large ..	.. ..	*Oval and round* ..	.. ..	.. ..	,, ..	Short to medium	Very large and numerous
15	,, ,, ..	.. ..	.. ,, ..	Pink ..	.. ..	.. ..	Medium to long	Tubers numerous
16	Large	.. ..	Oval	White and pink and white	White ..	.. ..	Long ..	Tubers *small*
17	.. .. ..	.. ..	Kidney	White ..	Cream ..	Medium ..	Short	
18	Small	.. ..	Oval and round ..	White netted	Yellow ..	Very early ..	..	
19	Medium	.. ..	Kidney and oval ..	White ..	Cream ..	Late ..	Medium to long	
20	Small	.. ..	.. .. ..	.. ..	.. ..	.. ..	Short	
21	,, ...	.. ..	Kidney	,, ..	.. ..	,, ..	,,	
22	,, ...	.. ..	Oval	,, ..	White ..	,, ..	,,	
23	Large	.. ..	Oval and round ..	Pink ..	Cream ..	,, ..	,,	
No. 177.								
1	Very large ..	.. ..	Oval	White ..	White ..	Late ..	Long	
2	Large and wiry ..	White ..	,, ...	.. ..	,, ..	,, ..	Short	
3	Small and compact..	.. ..	Kidney and oval ..	,, ..	,, ..	,, ..	,,	
4	Large and spindly ..	.. ..	Round and oval ..	,, ..	,, ..	,, ..	,,	

No.	Habit of Plant.	Colour of Flower.	Shape of Tuber.	Colour of Skin.	Colour of Flesh.	Time of Maturity.	Character of Stolon.	Remarks.
No. 177—*continued.*								
5	Medium	..	Oval	White	White	Late	Short	
6	,,	..	,,	,,	Cream	,,	Medium	
7	Very large	..	,,	,,	White	Very early	Short	
8	,, ,,	..	,,	,,	White and purple	Late	,,	
9	Large	..	,,	,,	White	,,	,,	
10	Medium	..	,,	,,	,,	Very early	,,	
11	Very large	..	,,	,,	,,	Late	Medium	
12	,, ,,	..	Round	,,	,,	,,	Short	
13	Large	..	Kidney	Yellow	Yellow	,,	Medium	Tubers poor
14	Very small	..	Oval	,,	,,	Very early	Short	,, ,,
15	Very large	..	,,	,,	,,	Late	,,	

THE MILLING AND BAKING QUALITIES OF VICTORIAN WHEAT.

(Continued from page 533.)

By A. E. V. Richardson, M.A., B.Sc., Superintendent of Agriculture; P. R. Scott, Chemist for Agriculture; and F. G. B. Winslow, Departmental Miller.

Part II.

In the last article consideration was given to the more important properties of wheat and flour. It is now necessary to review briefly the actual methods followed in milling wheat and testing flour. Such a review, while of interest rather to those actually engaged in the milling and testing of grain than the general reader, is of importance, in order that the results of the various tests may be viewed in proper perspective.

The Method of Milling the Samples.

Before a parcel of wheat can be effectively and economically milled a certain amount of "conditioning" is necessary, *i.e.*, the wheat has to be tempered either by the use of water, heat, or both water and heat, until the skin of the berry becomes toughened and capable of ready separation from the floury endosperm. This process of conditioning is one of the most important operations in flour milling, more especially when a miller has to deal with wheats of different qualities. If by conditioning we merely meant that the wheat must have a certain percentage of water, then conditioning of wheat would be a simple operation. It is, however, a more complicated process than appears at first sight. For illustration, consider the practice of the English miller, who receives wheat from all over the world. In this case it is necessary to blend, condition, and mill at the same time widely divergent types of wheat, some of which are flinty in character, others soft, whilst some are so dirty that they cannot be milled without washing. Since the operator has to bring this mixture on to the roll in an even temper and mellowness, break down the wheat under the rolls in a free manner without cutting up the bran, and at the same time release the maximum amount of semolina and maintain an unvarying standard in the quality of flour, it will readily be seen that the conditioning of wheat is a most important operation.

The practice of washing wheat in cleaning and conditioning is not generally followed in Australia for two reasons—(1) the average Australian wheat is soft, free from dirt, and the natural colour of the flour is the finest in the world; (2) Australian wheats assimilate moisture more rapidly than other wheats, and if allowed to stay in the water for any length of time they become water-logged and useless for flour making. The use of live steam just before the wheat enters the breaks has the effect of toughening the bran and helps to get all the bran from the endosperm without injuring the quality of the flour.

There can be no doubt that a little moisture added to the endosperm of the berry during the process of conditioning, besides bringing a

slight profit to the miller, has the effect of stimulating the enzymes and promotes some action amongst the constituents of the flour that has the effect of improving it. If the wheat is then milled at the proper time a sweet flavour is transmitted to the flour. If, however, the wheat is left too long before being milled, the good effects are lost and a secondary fermentation is set up which is detrimental to the flavour of the flour: also, too much moisture will be found in the endosperm. Consequently there will be a lot of highly-coloured break flour, but comparatively few high-class middlings.

With the small quantity and various types of wheat taken for a test in the experimental mill it would not be possible to use heat in conditioning with any hope of uniformity in the quality of the flour from

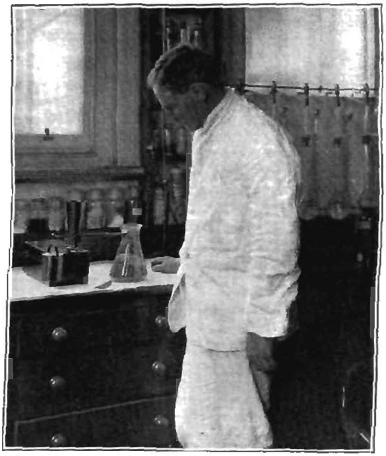


Fig. 7.—Chondrometer for testing the bushel weight.

the same variety milled at different times. The method followed, allowing for the hardness or otherwise of the berry, is to measure in a burette the water required, and then allow the wheat to lie in the conditioning trays until the wheat is ready for the break. Durum wheats require different treatment from the soft wheat, as they are of a hard, flinty character, absorbing water very slowly, and will stand severe treatment. The method followed in conditioning Durum wheat is to add the water required at three intervals during twenty-four hours.

To test the milling and baking qualities of the different varieties of wheat grown at the Experimental Farms, an experimental roller flour mill, made by Henry Simon and Company, driven by a three horse-power electric motor, an electric oven fitted with six electric heaters,

a thermometer with a high range of temperature, a proving cabinet fitted with eight electric globes and a thermometer, so that the heat could be regulated, was installed at the Agricultural Chemist's laboratory.

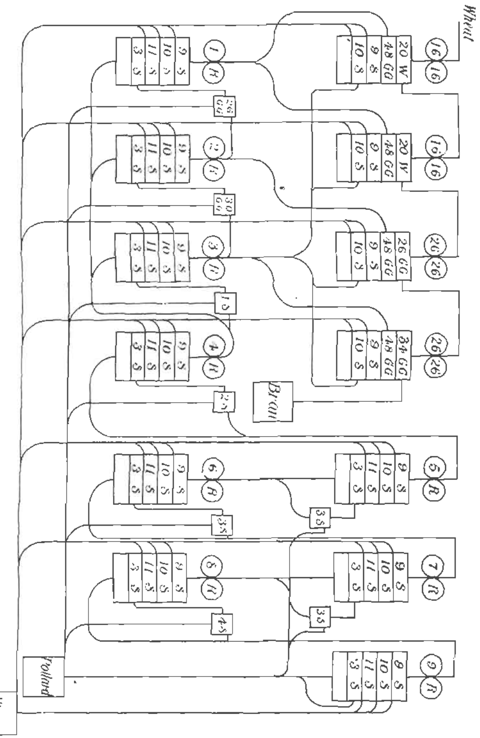
The flour mill consists of two roller mills, one for the breaks, with two sets of corrugated rolls, whilst the other, which is fitted with smooth rolls, is used for the reduction. One set of break rolls has sixteen corrugations to the inch, the other set twenty-six corrugations. The mill has two plan sifters, each fitted with four sieves. The roller mills and plan sifters are so constructed that as each sample is milled they can be taken to pieces, thoroughly cleaned, and all the products recovered: a set of hand sieves being used as accessories for extracting the offal.

One thousand grams of wheat (about $2\frac{1}{4}$ lbs.) are taken for each test. Working on such a small quantity, it is not possible to use purifiers with any hope of successful separation of the pure middlings and the by-products; these must be separated at every possible opportunity by means of hand sieves of different meshes, and easy reductions. The flour so obtained will compare favorably with commercial flour.

The corrugated rolls grind dull to sharp, and have a differential of $2\frac{1}{2}$ to 1. The fast roll runs at 400 revolutions per minute, and the slow roll at 160 revolutions per minute. The corrugations on the rolls are cut at a slight angle, and have a sharp saw-tooth edge. This prevents the rolls from interlocking should they be set too close, and also assists the shearing action at work. The rolls run at different speeds, which accelerates the separation of the bran and prevents the kernel from being flattened. The smooth rolls have a differential of $1\frac{1}{4}$ to 1: the fast roll runs at 400 revolutions per minute and the slow roll at 325 per minute.

As all scalping, grading, and dressing is done on the two plan sifters, the principle on which they work will now be explained. The plan sifter consists of four airtight sieves placed on top of one another and bolted down. The plan sifter is run at 120 revolutions per minute, and the motion rotary. The grind is passed from the rolls to the first sieve by an airtight sleeve, and by means of slats 2 inches apart, passes over the whole surface of the sieve. It then falls on to the second sieve. This process follows on automatically until the grind has been graded and sent to its proper destination.

When the wheat is cleaned and conditioned it is ready for the breaks. The feed on the rolls is so regulated that the stock under operation is touched by both rolls at the point of contact, care being taken that the berry is not crushed between one roll and the cushion of another berry. In order to obtain a proper finish on the break rolls, care must be exercised to make the first and second breaks do as much as possible without overdoing it. If this is not done, the latter breaks are overworked, and a good finish of the bran is impossible, as there will be a mass of fine mushy stock that will defy separation in a satisfactory manner. Summed up briefly, there are three main objects in breaking down the wheat—firstly, to make as large a percentage of sharp granular semolina as possible at each break; secondly, to leave the bran as clean and broad as possible: thirdly, to make as little break flour as possible.



Flow Sheet of Experimental Flour Mill.

Fig. 8.

The flow sheet on this page shows the process that is followed in milling samples, and the following is a description of the various stages in milling the wheat:—

1st Break.—The rolls have 16 corrugations to the inch, and are set to crack the berry down the crease, the chop passes to the plan sifter and is scalped on 20 wire, the tailings which pass over the 20 wire are sent to the second break. The throughs are dressed over 48 grit gauze, the coarse semolina that tails over is sent to the first reduction, the throughs are dressed over 9 and 10 silk, the fine semolina that tails over is sent to the third reduction, and the throughs break flour to the flour bin.

2nd Break.—The feed for this break is the tailings from 20 wire of the first break, as the best quality middlings are made at this break, averaging 30 to 40 per cent. of the total, the rolls are set with the object of making as much as possible at this stage, and as at no other break is the quality so good, the opportunity must not be missed to make as much middlings as possible. The rolls are, therefore set with this object in view. The chop is scalped over 20 wire, the tailings that pass over are sent to the third break, the throughs dressed on 48 grit gauze, the coarse semolina that tails over is sent to the first reduction, the throughs dressed over 9 and 10 silk, the fine semolina that tails over is sent to the third reduction, and the throughs break flour to the flour bin.

3rd Break.—For this break the finer set of rolls, 26 corrugations to the inch, are placed in the frame, the rolls are set to shape the bran, not to scrape or smash the semolina into flour, as this would increase the percentage of break flour, which is not a desirable feature in the gradual reduction process. The chop is scalped on 26 grit gauze, the tailings are sent to the fourth break, the throughs dressed on 48 grit gauze, the semolina that tails over sent to the second reduction, the throughs dressed on 9 and 10 silk, the fine semolina that tails over sent to the third reduction, and the throughs break flour to the flour bin.

4th Break.—The feed for this break is the tailings from the third break. The rolls are set so that the bran is just clean, with a slight imprint of the corrugations on it, but not too close to chip it. Too close setting of the rolls here will tear the bran into strips, and also press a yellow dye out of the bran which is detrimental to the colour of the flour. The chop is scalped and dusted over 34 grit gauze, and the tailings are sent to the bran bin, the throughs are dressed over 48 grit gauze, the semolina that tails over sent to the third reduction, the throughs dressed over 9 and 10 silk, the semolina that tails over is also sent to the third reduction, and the throughs break flour to the flour bin. This finishes the breaks, the stock is now about 10 per cent. flour, 20 per cent. bran, and 70 per cent. semolina.

The Reductions.—The treatment the wheat received on the corrugated rolls is called the break system. The second process on the smooth rolls is called reductions. It is essential, therefore, that a thin regular stream is fed on the full length of the roll, the pressure varying according to the size and quality of the stock, flaking carefully avoided, and all stock fed to the rolls should be kept as much alike as possible in quantity, quality, and size.

Many millers are putting in finely corrugated rolls (about 100 to the inch) for the first reductions, which they claim keep the flour cooler, more granular, avoid flaking, and add to the strength of the flour.

Owing to the gentle treatment of stock received in the experimental mill and dressing through 9, 10, and 11 silks, the flour is very granular, and, providing other things being equal, flour that has been coarsely dressed over 10 and 11 silks is better for baking purposes than one finely dressed. Bread made from the latter will not be so bold or good looking as that made from coarse flour. The finer flour will, however, be easier to knead and take water quicker. In grinding, care must be taken to avoid flaking. If flakes are formed, the starch cells are damaged, the strength and quality of the flour lowered, and it is impossible to obtain a clean finish on the last reduction. The object is to obtain as high a percentage of flour as possible without getting any of the pollard in the flour. If the middlings are treated harshly all the flour will certainly be extracted, together with a good portion of the pollard. The feed for the reductions is the endosperm of the wheat, and is composed of flour, middlings, and dunst. Dunst is a lighter product than middlings, and, looked at critically, appears to be part of the berry which has encircled the starch and forms the walls of aleurone cells. It is not so compact as the inner portion (middlings) just mentioned, and has a tendency when under operation to flatten out. In reality this part gives first notice of excessive pressure by flaking, and acts as a kind of cushion to protect the more valuable middlings. The object of reduction, summed up, means when and where to apply or relieve the pressure, and so to work the rolls that nothing is done to injure the baking

quality of the flour, and that all the flour in the stock is obtained in as pure a state as possible and free from impurities.

1st Reduction.—The coarse semolina from the first and second breaks is sent through this roll. The feed should look round, clean cut, and very sharp. The rolls on the second and third reductions are set to make as much fine middlings as possible for the fourth reduction. The grind is dressed on 9, 10, and 11 silks, the throughs sent to the flour bin, the middlings that tail over dressed on 3 silk, the tails hand-sieved on 26 grit gauze, the throughs sent to the second reduction, the germ and small particles of bran that are clinging to the endosperm sent to the pollard bin.

2nd Reduction.—The feed for this reduction is the coarse middlings from the first reduction and the third break. The rolls are set closer, the grind is dressed over 9, 10, and 11 silks, the throughs sent to the flour bin, the middlings dressed on 3 silk, the throughs sent to the fourth reduction, the tailings hand-sieved on 26 grit gauze, the throughs sent to the third reduction, and the tailings to the pollard bin.

3rd Reduction.—The feed for this reduction are the fine middlings from the first, second, third, and fourth breaks, together with the middlings from the second reduction and the coarse middlings from the fourth break. The rolls are set closer, the grind dressed over 3 silk, the throughs sent to the fourth reduction, the tailings hand-sieved on 1 silk, the throughs sent to the fourth reduction and the tailings to the pollard bin (about 80 per cent. of the pollard has been extracted on the three reductions).

4th Reduction.—The feed for this reduction are the fine middlings from the first, second, and third reductions, and the throughs of 1 silk. The rolls are set to make as much flour as possible. The first three reductions had been set to make as much fine middlings as possible for this reduction. The opportunity for a large release of flour must not be lost here, as at no other stage of the reductions is the colour or quality of the flour so good, and the stock will stand harsher treatment here, better than anywhere else. The grind is dressed on 9, 10, and 11 silks, the throughs sent to the flour bin, the middlings dressed on 3 silk, the throughs sent to the fifth reduction, the tailings hand-sieved on 2 silk, the throughs sent to the fifth reduction, and the tailings to the pollard bin.

5th Reduction.—The feed for this reduction are the middlings from the fourth reduction. The rolls are set closer, the grind dressed over 9, 10, and 11 silks, the throughs sent to the flour bin, the middlings dressed on 3 silk, the throughs sent to the sixth reduction, the tailings hand-sieved on 3 silk, the throughs sent to the sixth reduction, and the tailings to the pollard bin.

6th Reduction.—The feed for this reduction is the middlings from the 5th reduction. The stock is still sharp and granular, the rolls are set close, the grind dressed over 9, 10, and 11 silks, the throughs sent to the flour bin, the middlings dressed on 3 silk, the throughs sent to the seventh reduction, the tailings hand-sieved on 3 silk, the throughs sent to the seventh reduction, and the tailings to the pollard bin.

7th Reduction.—The feed for this reduction is the middlings from the sixth reduction. The rolls are set so that if there are any small particles of bran or germ in the stock they are flattened out and sent to the pollard bin. The grind is dressed on 9, 10, and 11 silks, the throughs sent to the flour bin, the middlings dressed over 3 silk, the tailings hand-sieved on 3 silk, the throughs sent to the eighth reduction, and the tailings to the pollard bin.

8th Reduction.—The feed for this reduction is the middlings from the seventh reduction. The stock is light and feathery, and requires gentle treatment to release the flour. The grind is dressed over 9, 10, and 11 silks, the throughs sent to the flour bin, the middlings dressed on 3 silk, the throughs sent to the ninth reduction, the tailings hand-sieved on 4 silk, the throughs sent to the ninth reduction, and the tailings to the pollard bin.

9th Reduction.—The feed for this reduction is the middlings from the eighth reduction. The condition of the stock is generally very poor, and it has to be taken into account when setting the rolls. The grind is dressed over 9, 10, and 11 silk, the throughs sent to the flour bin and the tailings to the pollard bin.

Methods of Testing the Samples of Flour.

As already indicated in Article I., the commercial value of a flour is determined mainly by its colour, strength, and gluten content. Certain conventional tests are applied to the flour to determine these points. Other tests of importance, especially in making comparisons of various flours, are the moisture and protein content, acidity, and, in special cases, the gliadin and soluble nitrogen content of the flour. Apart from determination of crude protein, which necessitates special apparatus and careful manipulation, the other tests used are readily executed, and can be performed after a little practice. Pre-eminence is accorded to the determination of the crude protein, since the protein content, in a large measure, determines the quality of the flour, especially from a nutritive point of view.

Protein Content.

The protein content is usually determined by the well-known Kjeldahl process. In the case of wheats, five grams are taken, and for flour one gram. The percentage of nitrogen, as determined by analysis, is multiplied by 6.25.

Colour.

A simple method of testing the colour has already been described. (*Journal of Agriculture, Victoria*, September, 1913, p. 530.)

Water Absorption Capacity.

The amount of water that a flour will hold on baking and yield a well-piled loaf is one of the most important factors in determining the value of a flour from a baker's point of view. The test as outlined is designed to obtain directly the number of quarts of water required to add to a 200-lb. sack of flour to make a dough of required consistency suitable for baking into bread. This operation depends largely upon the judgment of the individual, and can only be considered satisfactory after some lengthy experience correlated with actual baking tests on the flours. The *modus operandi* consists in weighing out 40 grams of flour, and placing in a porcelain basin and adding from a burette 20 centimetres of water, mixing well by means of a spatula into a paste. Then remove the paste from the basin and continue adding more water—a few drops at a time—kneading the ball of paste with the fingers until a dough is obtained of such consistency as will enable the operator to draw the dough out into long threads without breaking and remove it from the hands without

sticking thereto. The number of c.c.s. of water required to attain this object multiplied by two will give the number of quarts of water necessary to add to a 200-lb. sack of flour.

Wet Gluten.

Wheat when mixed with water possesses the property of forming a material which can be readily kneaded into any shape, and which on further washing with water, leaves a sticky adhesive mass, known as gluten. To determine the quantity of this residue in a flour 10 grams are weighed out into a porcelain basin and about 8 c.c.s. of water are added, the whole well kneaded together into a round ball of dough, allow this to stand for one hour, then hold between the fingers of the right hand under a stream of running water over a sieve of bolting gauze, keep working the ball continuously until no more starch remains intermixed with the gluten, any particles of gluten that may have been separated and washed away along with the starch can now be collected on the sieve and added to the main piece, which now should be worked sufficiently well to remove any adhering drops of water before weighing.

Dry Gluten.

After weighing, the wet gluten is placed in a water oven and kept there until on repeated weighing the weight remains constant.

VICTORIAN F.A.Q. WHEAT.

In order to review the milling and baking qualities of various types of Victorian-grown wheat in proper perspective, some discussion of the f.a.q. sample is necessary. The greater part of the Victorian wheat crop is exported each year, and practically the whole harvest is bought by reference to a definite standard of quality—the fair average quality, or f.a.q. standard, annually fixed by the Corn Trade Section of the Chamber of Commerce.

A similar practice obtains in other wheat-exporting States of the Commonwealth. Now, this f.a.q. standard is a composite sample prepared by mixing a large number of representative samples from the principal wheat-growing districts of the State in parts proportional to the production of each district. Provided that the number of samples obtained is large, that they are thoroughly representative, and that they are mixed in parts proportional to the production of the various wheat districts, the sample struck should be a fair average standard of the harvest of the State. The Corn Trade Section claims that the sample struck is a true average of the whole of the wheat of the State.

Assuming this claim to be true, let us consider the constitution and properties of the f.a.q. sample for 1912-13. For this purpose 2,000 grams of Victorian f.a.q. wheat (1912-13), obtained from the Chamber of Commerce, were carefully examined and all impurities removed by hand.

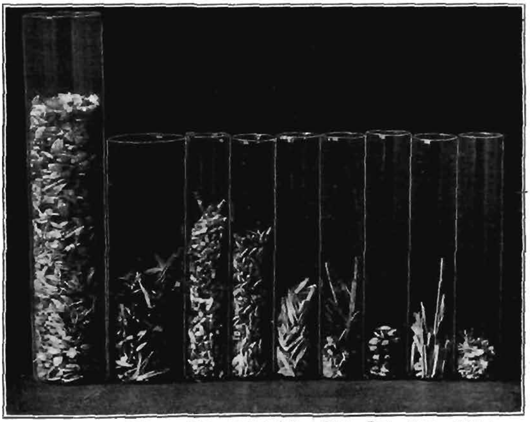
A similar procedure was followed with a similar amount of f.a.q. wheat obtained from the Chambers of Commerce of South Australia and New South Wales. The results of the test were as follows:—

TABLE I.

Showing Amount of Impurities in f.a.q. Standard Wheat of Victoria, New South Wales, and South Australia.

(Per 1,000 grams.)

—	Victoria.	South Australia.	New South Wales.
Oats	0·91	0·42	0·28
Wild Oats	1·96	0·24	0·14
Barley and Drake	1·66	3·00	0·27
Straw	0·11	0·02	0·02
Chaff	1·55	2·02	0·86
White Heads	0·62	0·43	0·31
Weed Seeds	0·22	0·21	0.07
Bunt	0·31	0·56	0·18
Rubbish	0·15	0·86	0·58
Total	7·43 =0·74%	7·76 =0·77%	3·71 =0·37%



Chaff. Wild Oats. White Heads. Barley and Drake. Oats. Weed Seeds. Bunt. Straw. Rubbish.

Fig. 9.—Rubbish and weeds in Victorian f.a.q. sample of wheat.

(*a*) Though the amount of impurities may not appear to be high, still, the amount is considerable if the total amount of wheat exported is taken into consideration. Assuming

that the export from these three States averages over a period of years, say, 20,000,000 bushels each, the amount of impurities exported with the wheat crops would exceed 10,000 tons per annum, the freight of which would amount to £15,000.

(*b*) It will be noted that the f.a.q. samples from every State contain bunt, a regrettable feature in view of the fact that the ravages of this fungus pest can be controlled by the farmer by the simple process of pickling.

(*c*) The New South Wales sample is freer from impurities than the other States—containing one-half of the amount present in the Victorian and South Australian samples.

(*d*) The chief impurity in the Victorian sample is wild oats, in the South Australian barley and drake, in the New South Wales sample chaff and rubbish.

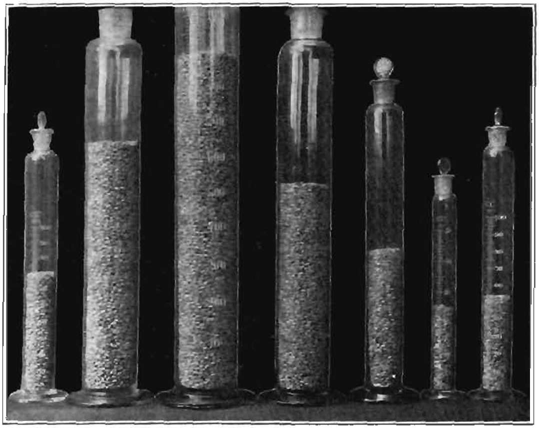


Fig. 10.—Grades of Victorian wheat.

If the f.a.q. sample is submitted to careful grading (after the removal of impurities) by means of specially-constructed hand sieves, interesting results are obtained. The meshes of the sieve best suited for this process of grading are respectively 3.25 millimetres, 3.00, 2.75, 2.50, 2.25, and 2 mm.

Table II., on the next page, indicates the results obtained by grading the wheats with these sieves.

From this table it will be seen that the Victorian sample contains a much larger proportion of plump grain than either of the other

two samples. Thus, no less than 70.8 per cent. of the Victorian sample was retained by a sieve with a mesh of 2.75 mm., whilst 62.2 per cent. was retained in the South Australian sample, and only 59.5 per cent. in the case of New South Wales wheat.

The grades of the Victorian sample are illustrated in Fig. 10.

The average amount of screenings present in the three f.a.q. samples is approximately 2.1 per cent. On the basis of a combined export of 60,000,000 bushels from these three States, the amount of screenings exported—comprising almost wholly cracked and shrivelled grain—would equal 33,750 tons on which the freight to London is 30s. per ton. There can be little doubt that the elimination of these screenings and impurities from our exported wheat parcels, either as a result of more efficient preparation on the farm or by the use of grading machinery in a system of State bulk handling, would further enhance the quality and value of Australian wheats on the world's markets, which enhancement must ultimately react in favour of the wheat-grower.

TABLE II.

Showing Amount of Grain of various Grades in 1,000 grams of Cleaned f.a.q. Wheat.

Dimensions of Sieve.	Victoria.	South Australia.	New South Wales.
3·25	34	24	32
3·00	230	164	124
2·75	444	434	439
2·50	195	218	283
2·25	60	116	90
2·00	12	25	14
Screenings.	25	19	18

The three f.a.q. samples were next compared with one another in respect to their chemical composition, and milling and baking qualities, so that the comparisons could ultimately be made of the f.a.q. samples with the different varieties of wheat under cultivation at the State farms. The following table gives these particulars:—

TABLE III.

Showing the Milling Qualities of f.a.q. Wheats.

Variety.	Bushel Weight lbs.	Break Flour.	Percentage of Mill Products.			Color of Flour.	Remarks.
			Flour.	Bran.	Pollard.		
		Per cent.					
New South Wales f.a.q.	62¾	8·3	69·91	19·76	10·32	Good	Bran broad, flour nice bloom, good appearance, lively
Victorian f.a.q. ..	63	8·25	70·92	18·88	10·18	Good	Bran broad, flour nice bloom, good appearance, lively
South Australian f.a.q.	62	7·6	70·12	19·68	10·19	Good	Bran thin, broad flour, nice bloom and appearance lively

The flours were then tested for moisture, protein, wet and dry gluten, and strength (water absorption capacity) with the following results:—

TABLE IV.

Showing Results of Tests of Flour of f.a.q. Samples.

	Moisture.	Protein.	Gluten.		Water Absorption.	Gluten Ratio.
			Wet.	Dry.		
	%	%	%	%	%	%
New South Wales f.a.q.	13·60	11·56	30·17	9·34	45·4	1–3·23
Victoria f.a.q. ..	13·97	11·06	25·97	7·81	44·8	1–3·32
South Australia *f.a.q.*	13·58	*10·31*	29·31	8·78	44·8	1–3·33

WHEAT AND FLOUR PROTEIN CONTENT.

		Wheat, per cent. of protein.		Flour, per cent. of protein.
New South Wales	..	*12·69*	..	*11·56*
Victoria ..	..	10·68	..	10·06
South Australia	..	*12·15*	..	*10·31*

The ratio between the total nitrogen and the soluble nitrogen has been advanced as affording some indication as to the quality of the flour. This determination is carried out by taking 10 grams of flour and shaking in a flask with 150 c.c.s. of water until a thorough mixture is obtained. The flask and its contents are then heated in a boiling water bath for at least five minutes, shaking frequently meanwhile, then cooling the solution and making up to 200 c.c.s. filtered, and 50 c.c.s. of the filtrate taken, and the nitrogen determined by Kjeldahl process in the usual way.

The ratio betwen the total nitrogen and the soluble nitrogen in twenty typical samples of good flours being 5.72—1, and in the case of seven samples of inferior quality being 1.85—1.

The f.a.q. samples were treated as above, and gave the following results:—

TABLE V.

—	Total Nitrogen.	Soluble Nitrogen.	Soluble. Total.
	%	%	%
New South Wales ..	1·85	0·460	4.02—1
Victoria	1·61	0·409	3·94—1
South Australia	1·65	0·386	4·27—1

Finally the flours were made into dough and baked in the electric baking oven. This gives a reliable test of the quality of the flour, the criterion being *the amount of well-piled bread of good texture and colour* produced per sack of flour. The method used in baking these flours was as follows:—340 grams of flour were taken, 6 grams of compressed yeast, 6 grams sugar, 5 grams salt, and water equivalent to the water absorption previously determined. All utensils and apparatus are kept at 90 deg. F. Each dough is given the same treatment in kneading, proving, and the length of time in oven. The flour is mixed and aerated by a hand mixer. The yeast is first added, mixed in a small quantity of water, and the sugar and salt in the remainder of the required water. The whole of the ingredients are mixed with the flour and kneaded together for fifteen minutes to make a satisfactory dough;

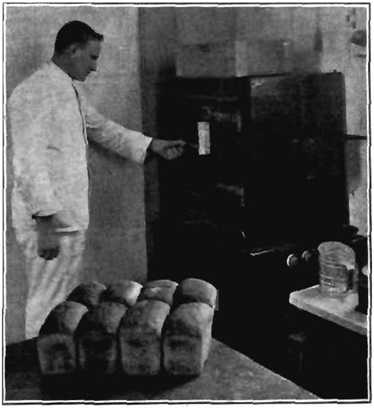


Fig. 11.—Electric baking oven.

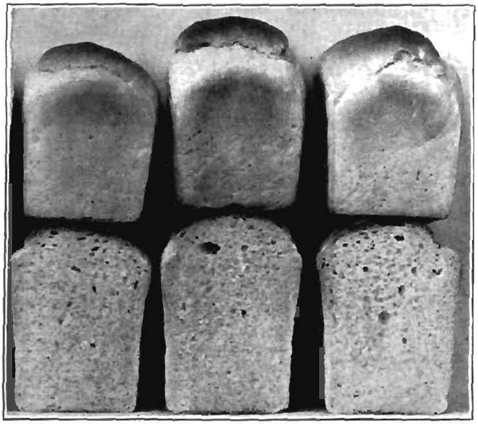
the dough is then placed in the proving cabinet. The process of proving entails three different operations:—the dough is first allowed to remain in the cabinet for sixty minutes; it is then knocked back and allowed to prove for another thirty minutes; it is then taken out and moulded, placed in a tin, put back into the cabinet, and allowed to prove until it appears to be in a suitable condition for removal to the baking oven.

The tin and its contents are then placed in the oven and baked for twenty minutes. The temperature of the proving cabinet is maintained at 90 deg., and the oven at 420 deg. F., by the aid of eight separate switches. The loaves are weighed one hour after, and twenty-four hours after leaving the oven. The volume of the loaf is measured by displacement with linseed. After twenty-four hours, the loaves are cut, and the colour and texture decided. In deciding texture, account is

taken of the crust, crumb, and pile. The crust should present fine even *pores without roughness or cracks, the crumb should be uniform* throughout as regards evenness and size of pores, and the body should be moist, friable, and elastic.

TABLE VI.—BAKING TESTS.

Variety of Flour.	Grams weight after 1 hour.	Grams weight after 24 hours.	Volume in cc.	Texture.	Color.	Water absorbed in dough.	Remarks.
New South Wales f.a.q.	472·5	463	1,580	Good	Good	192·4	Excellent loaf, rose well in oven
South Australian f.a.q.	474	464·5	1,415	Good	Good	191·2	Rose well in oven, good crust and appearance of loaf
Victorian f.a.q. ...	475·5	466	1,545	Good	Good	187	Excellent loaf, rose well in oven



S.A. 41 N.S.W. 42 V. 43

Fig. 12.—Three sets of loaves, Victorian, New South Wales, South Australian f.a.q. wheats.

The New South Wales sample was intermediate in bushel weight, gave slightly less flour than either of the other wheats, but the quality of the flour was superior to either Victorian or South Australian. The protein content of both wheat and flour were comparatively high, the gluten content and water absorption higher than either of the other

samples. The flour on baking gave an excellent loaf of good texture and colour, and the volume and pile were very good.

The Victorian sample gave the highest bushel weight, and yielded the greatest quantity of flour, but the flour contained slightly more moisture than the other samples. It had the lowest protein and gluten content and the lowest ratio of soluble nitrogen to total nitrogen. On the other hand, the yield of bread was good, and the volume and texture excellent.

The South Australian sample was lowest in bushel weight, intermediate in yield of flour, moisture, protein, and gluten content. The dough did not rise to the same extent as either Victorian or New South Wales, and the volume and pile of the loaf was slightly poorer than either of the other flours.

(*To be continued.*)

CITRUS CULTURE IN VICTORIA.

(*Continued from page* 541.)

PART VI.—MANURING.

By S. A. Cock, Orchard Supervisor, Bendigo and Northern District.

The four essential constituents of the soil necessary to the productiveness and general fertility of the citrus orchard are lime, nitrogen, phosphoric acid, and potash. Lime is present in most plants, and no commonly cultivated vegetable is found entirely devoid of this alkaline earth, and it is reasonable to deduce that it is an essential inorganic constituent of plants. Most of our citrus areas contain lime to a greater or less extent, but not always in a readily available form to benefit the plant. The writer, in referring to this in the *Mildura Cultivator*, of 8th September, 1900, said then:—" It seems almost paradoxical to say 'use lime in your soil,' for although your settlement is full of limestone, yet it is not in that readily available form which is so necessary to the tree." It is often necessary to apply lime to the soil. The most important office of lime is that of decomposing insoluble silicates, rendering certain of their constituents soluble, by liberating the alkalies present—viz., potash and soda—as soluble silicates, and thus available as inorganic plant food. Lime is most beneficial in clay soils, breaking up such by union of certain of its constituents with the lime, and liberating the alkalies present in the clay in a soluble form.

Lime is also an advantage in causing the more rapid decomposition of any excess of organic matters in soils, during the decomposition of which certain acids are liberated, which are injurious to plants. Lime neutralises and combines with these, and thus prevents injurious effects. Lime also acts on many injurious inorganic constituents in the soil, decomposes them, and transforms them into useful ingredients. Lime, if mixed with any manure which contains salts of ammonia, possesses a

greater affinity for the acids in combination with the ammonia than the volatile alkali itself has, the result is production of salts of lime, and the ammonia being liberated in gaseous condition is dissipated and lost. Gypsum (sulphate of lime) is also useful to correct black alkali (sodium carbonate) in the soil, as it renders the soluble humus and phosphates insoluble, but not unavailable as plant food, and retains them in the soil after the injurious alkalies have been washed out. The deduction is that lime corrects acidity and improves the mechanical condition of the soil, liberates plant food, especially phosphates and potash, decomposes organic matter, promotes nitrification and bacterial activity, and increases soil fertility.

In citrus culture lime is an essential both for the health of the tree, and the delicacy of the fruit. It should be applied in the autumn or early spring, after being properly air slaked in heaps throughout the orchard, then broadcasted thoroughly, and ploughed in. The quantity to be applied should be ascertained by a soil analysis from the Chemist for Agriculture, a most necessary proceeding every few years, to know exactly the condition of the soil to a depth of 2 feet, physically and chemically.

REPORT ON SAMPLES OF SOILS SUBMITTED BY MR. S. A. COCK, BENDIGO.

—	No. 1.	No. 2.	No. 3.	No. 4.	No. 5	Block 67, Bamawm.	
	McDonald, Koondrook. Soil to 2 feet.	Leaf loam *from* Koondrook.	Merbein, Mildura. Soil to 15 inches.	Merbein, Mildura. Soil to 2 feet.	Echuca. Soil to 2 feet.	C.1. Soil, 0 inches to 12 inches.	C.2. Soil, 12 inches to 24 inches.
Chemical Analysis.	%	%	%	%	%	%	%
Moisture	7·70	11·74	3·23	1·76	3·03	0·70	2·88
Loss on ignition ..	5·02	21·07	3·35	2·44	4·05	2·29	3·63
Nitrogen	0·078	0·579	0·058	0·014	0·035	0·042	0·028
Phosphoric acid	0·055	0·117	0·032	0·032	0·046	0·024	0·027
Potash	0·196	0·244	0·376	0·218	0·262	0·089	0·292
Lime	*0·200*	*0·680*	*0·556*	*0·848*	*0·321*	*0·174*	*0·214*
Magnesia	0·267	0·362	0·335	0·233	0·411	0·189	0·318
Chlorine	0·002	0·006	0·008	0·002	0·005	0·004	0·006
Re-action	Acid	*Neutral*	*Neutral*	*Slightly* alkaline	*Slightly* acid	*Slightly* acid	*Fairly* acid
Mechanical Analysis.	%	%	%	%	%	%	%
Very coarse sand ..	*Nil*	*Nil*	1·01	*Nil*	0·18	*Nil*	
Coarse sand	0·95	0·48	5·57	1·98	0·75	0·65	
Medium sand	0·63	0·75	12·69	8·58	0·81	1·05	54·00
Fine sand	3·53	6·88	38·14	59·41	11·01	34·44	
Very fine sand	26·57	19·51	18·41	15·82	25·48	38·60	
Silt	4·24	5·59	1·29	0·99	7·82	6·44	10·85
Fine silt	9·11	8·14	1·15	0·61	10·64	3·50	
Clay	42·25	25·84	15·16	8·41	36·23	12·33	28·64

The soils of Mildura can, to a large extent, be taken as typical of the pine ridge country of the Mallee. The Murray soils at Echuca and Koondrook as typical of the Murray fringe, and Bamawm as typical of Tongala and Rochester.

Plate 23 represents five-year-old Washington navel grown on the soil from which Sample No. 1 was taken. The soil has been enriched by a dressing of one load of leaf loam to each tree when planted. Sample No. 2 is extremely rich in all necessary plant food. Mr. Nelson,

of Gannawarra, at the writer's suggestion, nine years ago dressed his trees with a similar loam, and the results have been highly satisfactory; both he and Mr. McDonald state that one application of a load per tree every six years is sufficient for all the requirements of the tree. The orange and lemon trees in these orchards are a lustrous green colour, the fruit of excellent texture, with thin deep-coloured rind, the Washington navels for uniformity of size and prolific bearing hard to excel. Every grower will not be able to procure leaf loam for his trees, but wherever obtainable, it is the finest dressing that can be applied, adding both bulk and manure to the soil. The analysis will act as a guide to the grower in selecting suitable manures for his orchard. Sample No. 1 was virgin soil, taken outside the line of orchard trees. Samples Nos. 3, 4, Merbein, Mildura soils, are deficient in nitrogen and phosphoric acid. These soils, as do also Samples C1, C2, Block 67, Bamawm, which is the suitable citrus soil typical of Rochester and Tongala district, require green manuring; and it is advisable to prepare the ground before planting by sowing a crop of peas or tares along with a dressing in the autumn of blood, bone, and super., ½ cwt. of each to the acre, and plough the green crop under in August, and barrow it down before planting. These soils require humus; and manuring, as suggested, is beneficial, not only to the trees, but renders the soil more suited to irrigation, by preventing the hard caking condition so manifest under irrigation culture. At Nyah, and in many of our northern districts, where similar soils are worked, this practice of green manuring as a preparation of the soil for orchard trees, is becoming more general every year.

Sample No. 5, Echuca soil, is deficient in nitrogen and phosphoric acid; it has been for many years in cultivation without manuring, and requires similar treatent by green manuring (if leaf loam be not obtainable). It is a similar soil to Sample No. 1, and produces excellent oranges and lemons.

Plates 12, 25, 26, represent 12 years' old trees grown on similar soil to Sample C1, C2, Bamawm, and it will be observed that green manuring is carried on in this orchard by allowing a crop of natural and introduced grasses to grow during the winter, and plough them under in early spring. This practice is now almost general in the north, but it requires manures to first produce the conditions necessary to successfully raise the growth of green matter. At various periods manure should be given to stimulate the soil, and keep the tree supplied with the necessary food.

Nitrogen is largely required for the growth of the tree; nitrogen, phosphates, and potash for the annual production of good crops of fruit as will be shown. Every 1,000 lbs. of fruit contains the following:—

—	Nitrogen.	Potash.	Phosphoric Acid.
Oranges ..	2 lbs.	2¼lbs.	1lb.
Lemons ..	1¼lbs.	2¼lbs.	1lb.

Nitrogen, if over supplied, causes soft green growth of the foliage liable to disease, and makes the rind of the fruit puffy and increases the rag.

Potash is plentiful in the soils considered, but the supply requires to be maintained.

Phosphoric Acid is deficient.

Nitrogen may be applied in the form of green manure, or gradually soluble blood and bone manures. Phosphates in the form of bone-dust: or, if readily required in the soluble form of superphosphates, and where trees show any lightness of colour, in the form of Thomas' Phosphate.

Potash is best applied as sulphate of potash. All manures should be applied in the autumn or early spring, early spring for preference, and every grower should have the benefit of a soil analysis. Manures are necessary, but require rational and intelligent application. The small feeding roots of the orange and lemon, immediately under the trees, absorb carbonic acid from the air; the soil above these roots should be lightly cultivated, and if mulching is carried out under the trees, only a dressing of two or three inches in depth should be given. Avoid fresh stable manures for mulching under the trees. Stable and farm-yard manures are beneficial, but should be well rotted, and applied equally all over the orchard. Equal manuring, equal cultivation, and equal watering induce the proper functions of the roots.

(To be continued.)

PANAMA CANALS.

Speaking at a dinner held by the London Chamber of Commerce, Senor Perez Triand, Chargé d'Affaires for the Republic of Salvador, told those present that "since the days of Columbus there had been numerous projects for building a canal, but there was one route in existence of which one heard nothing—it was there for the day when the requirements of trade and commerce would be so large that two canals would be needed. The route he referred to was the Atrato River, which flowed into the Gulf of Uraga, quite close to the Isthmus of Panama. It was a perfectly navigable river, and its upper reaches were comparatively near to the Pacific littoral. The site had been studied by a well known engineer, who stated that this route would be considerably cheaper than the Panama Canal. Humanity would so progress both materially and morally that the day would come when both canals would be free and open to the whole world."—*Tropical Life.*) Such a proposition must affect the primary producers of Australia to their great advantage. So haste the day when such a canal under such conditions is an accomplished fact.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.R.H.S., Principal, School of Horticulture, Burnley.

The Orchard.

By the time these notes are issued, the orchard ploughing and cultivation should be completed. The winter has been exceptionally dry, and spring has set in early. It will, therefore, be very necessary to keep the surface well earth-mulched, so as to conserve as much soil moisture as possible. The experience of other years has shown that in spring time the ground hardens very quickly, especially in warm or windy weather, and so early ploughing is always a necessity. Even if rain follows the spring ploughing, it will be easy to cultivate afterwards.

That the season is an early one is indicated by the early blossoming of all kinds of fruit trees. The earliest pear tree in full bloom in the Burnley Orchards was a variety known as "Chinese," and this was in full bloom in the third week in July, while last season it did not reach this stage until the middle of August, and in 1911 it was in the same stage early in September.

These indications point to an early season: and it will be well to have both ploughing and cultivation completed early, in case the predictions of a mild season should not be realized. Ploughing and harrowing should be thorough, and all weeds and herbage should be well covered, and the surface tilth made as loose and clean as possible.

All cover crops intended for green manure should be ploughed in now. These may need breaking down with a disc, a roller, or with a chain on the plough before covering.

Spraying.

Spraying for all pests and diseases is now a prominent work in the orchard. Bordeaux spraying for black spot of apples and pears, for scab and shothole in apricots and peaches, for leaf curl of peach, and for rust of plums and peaches should now be completed. Where there are indications that previous sprayings have not been thoroughly successful, a second spraying should be given.

Wherever they are present, nicotine sprays should be used to combat peach aphis, and the pear and cherry slug. For the latter pest, arsenate of lead should not be used if the cherries are within a month of ripening. Arsenate of lead is so tenacious, and thus it is likely to remain on the fruit until it is ripe, when it would be dangerous to the consumer. Thus, while this property of remaining on the fruit for a considerable time is of great value in the codlin moth spraying, it is of quite the opposite value when used for cherry slug. Either tobacco water or hellebore is useful for the eradication of this

pest, as these substances do not remain long on the trees, and they are quite as effective as arsenate of lead.

Codlin moth spraying, too, will be in evidence this month. Owing to the early season, it is just possible that the development of the moth will take place earlier. It is generally assumed that the appearance of the moth is coincident with the bursting of the flowers. This is not always so—the moths frequently come slightly later than the bloom period. Owing to the rapid expansion of the fruit, it is well to follow the first spraying with a second in a week or ten days' time. Arsenate of lead is still the spray for codlin moth, nothing having been found to supersede it.

General.

Citrus trees of all sorts may now be planted, care being taken that neither the young trees nor the soil is allowed to dry.

Graft ties will need examining, and, where any growth has taken place, they may be loosened slightly. In hot, dry, or windy weather the grafts will benefit greatly by an occasional spraying with water. On such days the transpiration of moisture from the foliage is very great, and, so far, a perfect union has not taken place; thus there will be a loss of sap, which cannot readily be replaced, and the graft will probably suffer considerably.

Vegetable Garden.

The surface soil requires to be well pulverized at this time of the year; it should be kept well hoed, especially after the necessary frequent waterings, and all weeds must be suppressed. Apart from their harmfulness in robbing plants of food and moisture, the weeds, if allowed to remain and seed, become a menace to future economical work.

The top dressing and weeding of asparagus beds will now be necessary; the beds should be well cut over as often as necessary, removing all growths, small and large. It is a mistake to allow the small stems to grow on, because they may be too small for cutting.

Plantings of tomatoes may now be carried out; all early-planted plants should be fed, staked, and the laterals pinched back. A little bonedust or superphosphate may be given, but these are not equal to animal manures, if the latter are available. Chemical manures should be only given in a limited quantity. Six or 7 cwt. per acre would be a heavy dressing, and this works out at nearly 3 ounces per square yard. Vegetable growers may easily try this for themselves, and it will be seen that 3 ounces scattered over a square yard of surface will appear to be a very light dressing.

French beans, carrot, parsnip, celery, radish, peas, and turnip seeds may now be sown. Seeds of cucumber, melon, and pumpkin family may now be sown in the open ground. All seedlings may be transplanted on favorable days, and it will be well to sprinkle the tops when planting out, as well as to water the roots.

Flower Garden.

As in other sections, there should be no clods on the surface, the soil should be friable, and no surface cracking should be allowed. As often as a watering is given, so a hoeing should succeed this work. Flowering plants suffer exceedingly through loss of soil moisture, and hard and compact surfaces are detrimental to their successful growth. It is always helpful to plants, and especially so on hot, sunny, and windy days, to have the surface well hoed. In addition to conserving the soil water, it creates cool soil conditions, which are so helpful to good root action at this season of the year. Hoeing also keeps down the weeds, which need keeping down, and which should not be allowed to seed in the beds.

Roses will need attention, as both rose aphis and mildew will be making their appearance. For the former, strong tobacco and soap sprays, Robinson's Pine Spray, Benzole emulsion, and Soaperine are all very helpful in its eradication. For mildew, the plants should be dusted with sulphur when the foliage is moist; a dusting of sulphur on the ground under the bushes will be useful, as the fumes will be helpful in checking the fungus. All leaf-eating insects on any plants may now be suppressed with arsenate of lead, or with Paris Green.

Beds should be well dug over in preparation for chrysanthemum or dahlia planting; if these plants are not to be grown in separate beds, a few may be planted out for early flowering.

Bulbs that have finished flowering, and that have lost their foliage, should be lifted and stored. The foliage must not be cut off while it is still green, as this means loss of sap and energy.

Tender and half-hardy and other annuals may be planted out for summer and autumn flowers. These include asters, zinnia, salvias, balsams, amaranthus, celosias, &c.; lobelia, bedding begonias, iresines, and alternantheras may also be planted in the beds and borders.

THIRD VICTORIAN EGG-LAYING COMPETITION, 1913–14.

Commencing 15th April, 1913.

CONDUCTED AT BURNLEY HORTICULTURAL SCHOOL.

No. of Pen.	Breed.	Name of Owner.	Eggs laid during Competition. April 15 to Aug. 14.	Aug. 15 to Sep. 14.	Total to date—5 months.	Position in Competition.
23	White Leghorns ..	J. H. Gill	533	152	685	1
61	" ..	*Jno. Campbell* ..	481	133	614	2
48	" ..	Thirkell and Smith ..	472	141	613	3
65	" ..	E. A. Lawson ..	480	133	613	
11	" ..	C. J. Beatty ..	465	144	609	5
6	" ..	J. S. Spotswood ..	469	138	607	6
8	" ..	E. H. Bridge ..	461	136	597	7
68	" ..	Jones and Curtis ..	438	148	586	8
16	Black Orpingtons ..	D. Fisher	436	144	580	9
10	White Leghorns ..	T. A. Pettigrove ..	434	144	578	10
31	" ..	*W. G. Swift* ..	436	136	572	11
46	*Black Orpingtons* ..	T. *W. Cole* ..	435	117	552	12
34	White Leghorns ..	J. E. Bradley ..	415	136	551	13
35	" ..	Moritz Bros.	417	134	551	
50	" ..	A. H. Mould ..	414	137	551	
21	" ..	A. Ross	420	128	548	16
49	" ..	M. H. Noye ..	399	137	536	17
7	" ..	H. McKenzie ..	389	143	532	18
37	" ..	C. H. Busst ..	391	141	532	
66	" ..	*W. Featherstone* ..	393	127	520	20
32	" ..	H. Hanbury	370	140	510	21
40	" ..	Geo. Edwards	372	134	506	22
20	" ..	C. B. Bertelsmeier ..	365	138	503	23
26	" ..	B. Rolls ..	374	125	499	24
43	" ..	Morgan and Watson ..	367	128	495	25
5	" ..	G. W. Robbins ..	345	148	493	26
47	" ..	W. McLister ..	375	112	487	27
63	" ..	A. Sellers	355	131	486	28
2	" ..	*R. W. Pope*	356	129	485	29
41	" ..	Percy Walker ..	356	129	485	
13	Black Orpingtons ..	*F.* S. Dallimore ..	351	128	479	31
58	White Leghorns ..	Stranks Bros. ..	349	129	478	32
39	" ..	W. Purvis	354	123	477	33
24	" ..	Redfern Poultry Farm	344	126	470	34
38	" ..	M. A. Monk ..	342	127	469	35
67	" ..	C. Hepburn ..	344	115	459	36
45	" ..	D. Gouddie ..	333	124	457	37
25	*Black Orpingtons* ..	King and Watson ..	337	118	455	38
59	White Leghorns ..	Cowan Bros.	318	132	450	39
14	" ..	F. Hannaford ..	338	111	449	40
3	" ..	S. Buscumb ..	311	122	433	41
18	" ..	B. Rowlinson ..	311	122	433	
52	" ..	W. G. Osborne ..	300	128	428	43
55	" ..	P. H. Killeen ..	305	121	426	44
27	" ..	J. Sinclair	312	103	415	45
42	" ..	A. Stringer ..	275	140	415	
33	" ..	South Yan Yean Poultry Farm	273	141	414	47
22	" ..	B. Mitchell ..	285	122	407	48
62	" ..	G. A. Gent ..	285	121	406	49
12	" ..	A. H. Padman ..	248	145	393	50
53	Black Orpingtons ..	A. Greenhalgh ..	258	135	393	
56	White Leghorns ..	Schaefer Bros. ..	254	132	386	52
44	" ..	W. A. Rennie ..	260	124	384	53
54	" ..	Jas. McAllan ..	232	145	377	54
57	" ..	Gleadell Bros. ..	256	113	369	55
51	Black Spanish ..	W. H. Steer ..	243	125	368	56
36	White Leghorns ..	A. J. Jones.. ..	237	125	362	57
17	R.C.Brown Leghorns	S. P. Giles	260	97	357	58
19	*White Leghorns* ..	W. *Dunlop* ..	243	108	351	59
28	" ..	E. Waldon ..	236	114	350	60
29	" ..	S. Brundrett ..	189	141	330	61
64	Golden Wyandottes	C. L. Sharman ..	191	126	317	62
30	Black Orpingtons ..	Jas. Ogden ..	177	138	315	63
15	White Leghorns ..	J. Shaw	189	95	284	64
60	Black Spanish ..	Watson and Rushworth	155	128	283	65
4	White Leghorns ..	Jas. Brigden ..	151	110	261	66
9	" ..	Sylvania Stud Farm..	132	95	227	07
		Totals	22,391	8,612	31,003	

THIRD VICTORIAN EGG-LAYING COMPETITION, 1913-14.

MONTHLY REPORT, ENDING 14TH SEPTEMBER.

The fifth monthly report of the above competition is as follows:—

The weather during this month has been mild, with the exception of the first four days, when rain fell, and it was foggy and damp. The lowest morning temperature was 33 deg. Fahr., the remainder of the month being mild. This has accounted for the increase in egg production, the output being 8,612, as compared with 7,620 eggs last month.

The leading pen, J. H. Gill (pen 23), has now a grand total of 685 eggs; the second, Jno. Campbell (pen 61), has 614 eggs to its credit; while A. E. Lawson (pen 65), and Thirkell and Smith (pen 48), 613 eggs, are equal for third place.

Food.—The morning mash was similar to that of the former month, and at mid-day a mash of bran and pollard, mixed with hot liver soup, was given. On several occasions raw onions were cut up fine and mashed into the pollard. Grain consisted of wheat, except during cold winds and wet weather, when a mixture of wheat, five parts, and maize, three parts, was fed. Green food at mid-day consisted of grass, thistles, and green lucerne chaff, which were also fed in the morning mash.

Broodiness is becoming more pronounced as the warm weather advances. Several of the pens of heavy breeds have had three broodies, while three pens of Leghorns are showing symptoms, one in particular (pen 23) being cooped; the others are pens 54 and 48.

The general health of the birds is excellent, all being bright and vigorous.

The total rainfall for the month was 111 points.

REMINDERS FOR NOVEMBER.

LIVE STOCK.

HORSES.—Continue to feed stable horses well; add a ration of greenstuff. Rug at night. Continue hay or straw, chaffed or whole, to grass-fed horses. Feed old and badly-conditioned horses liberally. If too fat, mares in foal should be put on poorer pasture.

CATTLE.—Except on rare occasions, rugs may now be used on cows on cold and wet nights only. Continue giving hay or straw. Beware of milk fever. Read up method of treatment in *Year-Book of Agriculture*, 1905. Have cows' milk weighed and tested for butter fat. Rear heifer calves from cows giving satisfactory results. Give calves a warm dry shed and a good grass run. Keep calves' premises scrupulously clean and regularly disinfected with Phenyle or Condy's Fluid. Feeding vessels must be kept clean. Skim milk should be scalded, unless it is known that the cows are healthy. Give the calves a regular quantity, and do not overfeed. Better too little than too much. Give milk at blood heat. Dehorn all calves, except those required for stud or show purposes.

PIGS.—Supply plenty of bedding in warm well-ventilated styes. Keep styes clean and dry, and feeding troughs clean and wholesome. Sows may now be turned into grass run. Read articles on breeding and feeding in *Journals*, April, 1912, and June, 1913.

SHEEP.—Prepare for dipping. Powder or paste dips have the most lasting effects, particularly where lice have been bad. Ascertain correct contents of bath before mixing the dip. Keep sheep in bath not less than half a minute, if badly infested, longer. Submerge heads twice. Dip big sheep first, lambs last. Yard sheep overnight; dip while empty, and avoid fouling the drainer so much. Commence early in the day, and the sheep can dry before nightfall. Avoid travelling long distances to baths and dipping sheep while overheated. Do not roughly throw sheep in. Avoid filthy baths, particularly in hot areas; filth increases a dead tip; clean out the bath occasionally. Merino and fine comeback ewes come in season, as a rule, now. Mate plain roomy ewes to level, thick-shouldered, good-fleeced Lincolns; yolky, wrinkley sorts to English or Border Leicesters; very small merino ewes to blue-faced, medium-boned old type of English Leicester, as they cause less lambing troubles.

POULTRY.—Provide plenty of green food and shade. Watch for vermin; spray perches with kerosene and houses with solution of 3 per cent. crude carbolic acid mixed with a little lime and soft soap. Keep water clean and cool. Discontinue feeding maize and reduce meat ration. Some Epsom salts should be placed in water weekly. Fresh skim milk, if available, should be given. Remove all male birds from the flock. Infertile eggs only should be used when pickling, or when placed in cool storage.

CULTIVATION.

FARM.—*Plant main crop of potatoes. Cut hay and silage. Weed early* potatoes. Sow maize and millets. Weed tobacco beds, and water, if dry.

ORCHARD.—Ploughing, harrowing, and cultivating to be continued. Weeds to be kept down. Secure, pinch, and spray grafts with water. Spray frequently for codlin moth, pear and cherry slug, and peach aphis. Plant out citrus trees.

VEGETABLE GARDEN.—Hoe and mulch surface. Suppress weeds. Water where dry and hoe afterwards. Disbud and pinch back tomato plants. Sow celery, French beans, peas, lettuce, cucumber, melon, &c., seeds.

FLOWER GARDEN.—Water and mulch. Cultivate and keep down weeds. Thin out weak wood from roses. Prune early all flowering shrubs that have finished flowering. Lift and store bulbs. Plant out dahlias and chrysanthemums. Liquid-manure herbaceous perennials.

VINEYARD.—*Field grafts require careful attention in the way of removal of* suckers and scion roots. Cultural work, such as scarifying and hoeing, should be actively pushed forward, so as to provide as good a "mulch" as possible *during summer. Proceed with tying up, stopping, and topping.* Avoid excessive topping, summer pruning being usually more injurious than useful in warm, dry climates. Cincture Zante currant vines as soon as flower caps have fallen. *Apply second sulphuring just before blossoming, wherever Oidium was prevalent* last year.

Cellar.—Same as last month.